Saskatchewan
Energy and Mines

Saskatchewan
Geological Survey

Seismic Investigations on the Perimeter of the Athabasca Basin in Northern Saskatchewan

(Wollaston Lake — Black Lake Areas) NTS 64L (part) and 74P (part)

J. V. Suryam

1984

Report 216 B

Printed under the authority of the
Minister of Energy and Mines

Abstract

During the summer of 1977, a refraction seismic survey was conducted on the eastern edge of the Athabasca Basin. The objectives of the survey were: 1) to delineate the edge of the Athabasca Basin in the region, 2) to find the thickness of the Athabasca cover rock, and map the pre-Athabasca topography, 3) to establish the structural setting of the Gulf Mineral's Rabbit Lake uranium deposit on the western shore of Wollaston Lake. The economic consideration behind these investigations was to define other areas favourable for the occurrence of uranium ore deposits in this part of the Athabasca Basin.

Key Words: Athabasca Basin, uranium exploration, seismic surveys

Contents

	Page
Abstract	1
List of Illustrations	3
Introduction	
Location and Accessibility	5
Physiography	6
Previous Work	6
Objectives	6
Fieldwork and Acknowledgements	6
Background Geology	
General Geology	7
Rock Units	7
Structure and History	7
Economic Background	9
Structural Control of Ore Deposition	9
The Seismic Method	9
Seismic Results and Interpretations	9
Conclusions and Recommendations	14
Bibliography	15
Appendix — Profiles showing topography of land surface and sub-Athabasca basement surface	16

List of Illustrations

	Page
Figure 1 — Location Map	5
Figure 2 — Map showing the regional structural setting of the study area	8
Table 1 — Rock Units	7
Table 2 — Notes on the seismic profiles	12
Map 1 — Geographically located seismic profiles drawn to show basement surface (South half of the area)	in pocket
Map 2 — Geographically located seismic profiles drawn to show basement surface (North half of the area)	in pocket

Introduction

Location and Accessibility

The area covers about 7200km² along the eastern perimeter of the Athabasca Basin (Fig. 1), falling in the western half of NTS 64L and southern half of NTS 74P, and lies between Latitudes 58°00′ and 59°15′ north and Longitudes 103°00′ and 105°30′ west. The Rabbit Lake mine lies in the south central part and is located approximately 350 km north of La Ronge.

The discovery and development of the Rabbit Lake deposit has resulted in considerable development in this region. There are regular flights between La Ronge and Rabbit Lake air strip while Highway No. 105 allows all weather access from Rabbit Lake to La Ronge. Numerous local gravel roads exist in the area, but for seismic surveys the best access is by float plane.

Figure 1 — Location Map

Physiography

The area shows moderate relief between 411 metres in the south (Wollaston Lake) and 281 metres in the north (Black Lake). The topography is influenced by the regional north-easterly structural grain of the Precambrian basement. There are few outcrops penetrating the extensive glacial deposits, and most occur to the east of the area along the western shores of Wollaston and Hatchet Lakes. A few outcrops occur to the north of the area in the Black Lake region near Cyprian Lake.

Previous Work

Systematic ground geophysical survey has not been undertaken previously although a few scattered local grid geophysical surveys have been conducted by Gulf Minerals and other mining companies in the area. The information from these surveys is of limited use in formulating the geology of the area. Moreover, due to proprietary rights of the leaseholders, these data are not released to the public.

Objectives

The objectives of the seismic survey are: 1) to delineate the edge of the Athabasca Basin, a known provenance for uranium deposits (e.g. Rabbit Lake uranium orebody), 2) to find out the thickness of the Athabasca cover rocks and map the sub-Athabasca topography, in that the known uranium deposits occur close to the contact between the Athabasca Formation and the basement, 3) to establish the structural setting of the Rabbit Lake deposit so as to identify structural dispositions in the area favourable for similar mineralization.

Fieldwork and Acknowledgements

The seismic field operations were conducted during the summer of 1977 and the seismic data were computer processed, analysed and interpreted during the following winter at headquarters in Regina, The seismic sections are drawn to the scale of 2.54 cm to 300 metres horizontally and 60 metres vertically in order to show adequately the details of the subsurface. The 1:50,000 scale topographic maps published by the Federal Department of Energy, Mines and Resources, Ottawa, were used as base maps to locate the seismic lines. On the ground, line-cutting was done along compass traverses 5 miles (8 km) apart, each line about 5 miles (8 km) in length. In the southern portion of the area, which is mostly covered by Gulf permits, the lines that were cut earlier by Gulf Minerals exploration division were used for the seismic traverses whenever possible. A Beaver aircraft was employed on a call basis during the field season to transport the seismic crew between the base camp and seismic lines. On the lines, the seismic equipment was back-packed and shooting was done on one-mile long spreads, two-ways, with the shot point alternately at either end of the spread (Suryam, 1981a). Continuous coverage on each traverse was obtained by rolling the spreads end to end. The refracted seismic signals were picked up at 220-foot intervals from the shot point, i.e. 24 pick-ups were used over a spread length of one mile. The seismic signals were recorded on the 24-channel seismograph unit and printed out on a roll of dry-write recording paper. The records were checked, edited for reference and filed securely for later computer data processing. The elevations at the shot point and the geophones were recorded from a precision altimeter. Leap-frog loops were used to establish corrections to the observed altimeter readings due to changes in the atmospheric pressure during the periods of the altimeter runs. A total of 130 line miles (208 km) of two-way refraction profiles were shot during the field season.

The author gratefully records the excellent guidance and timely assistance rendered by Dr. J. E. Christopher, Assistant Director, and Dr. L. S. Beck, Director of the Saskatchewan Geological Survey, in conducting the Seismic Survey. Thanks are due to Drs. J. E. Christopher and D. F. Paterson for editing the report. Mr. Pat Kydd and Mr. Ken Jones drafted the figures.

Background Geology

General Geology

Due to the extensive glacial overburden, there are few outcrops present. From the regional geological framework, however, the area is known to be situated over the eastern rim of the Athabasca Basin (Fig. 2), with metamorphic and igneous basement rocks exposed to some extent, to the east and north of the area. However the contact between the Athabasca Formation and the underlying basement rocks is nowhere exposed in the study area.

Rock Units

Surface geological mapping of the area lying to the east and south of the area covered (Ray, 1978, 1979; Wallis, 1971) indicates a variety of rock types from several distinct time periods. These are summarized in Table 1.

Structure and History

The area covered straddles two major geological domains with distinct lithological characteristics and structural styles (Fig. 2); namely the NE-SW trending Wollaston demain to the southeast, and the Mudjatik domain to the northwest. The junction between these in the covered area, presumably passes west of Collins Bay tracking NE-SW. The differences in the lithological and structural styles of the basement rocks on either side of this line result from the differences in the thermotectonic histories of the two domains. Archean basement rocks in the Wollaston domain comprise granites and foliated granites, whereas in the Mudjatik domain, the Archean rocks are mainly migmatites. In the Wollaston domain the structural deformation is dominated by two events, the D1 and D2. The earlier D1 event formed elongated mantled gneissic domes, and the later D2 event produced the flattening of the sides of the gneissic domes resulting in doubly plunging antiform structures with predominant NE-SW trends in the Archean and Aphebian basement rocks (Ray, 1977). Subsequent weathering and erosion have produced basement inliers with the Archean granitic rocks remaining as cores of the doubly plunging antiform structures. These are overlain by flatlying Athabasca Formation. In contrast, the deformation style in the Mudjatik domain is variable, with structural trends varying from east-northeasterly to west-northwesterly directions. Several elongate narrow belts of pelitic/semipelitic metasedimentary gneiss, up to 25 km long and 5 km wide, underlie the Mudjatik domain in places. It is believed that the Mudjatik domain represents the core region of a Hudsonian Mobile Belt involving the early development of flatlying migmatite lobes and nappes (Ray, 1978), and the junction between the Mudjatik and Wollaston domains in the covered area presumably represents the edge of a southeasterly plunging nappe lobe.

Table 1 — Rock Units

Age	Rock Type and Relationship		
Pleistocene	Glacial Deposits		
	Unconformity		
Helikian	Athabasca Formation (mostly sandstone)		
	Unconformity		
Aphebian	Biotite Schists Meta-Arkose Pelites (Semipelites)	Wollaston Group	Pre-Athabasca (Basement)
	Unconformity		
Archean	Granulites and Granitic Gneisses		

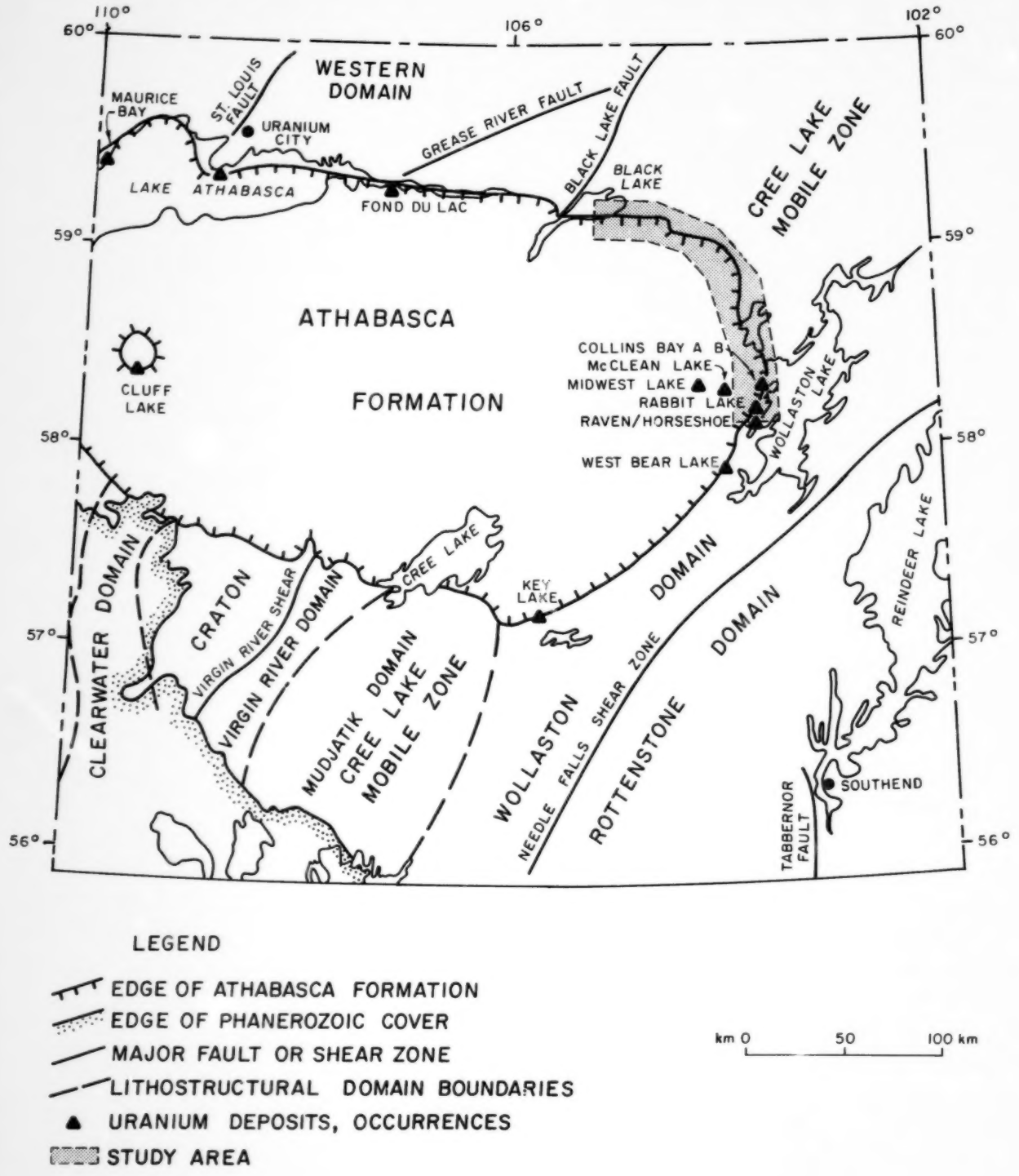


Figure 2 — Map showing the regional structural setting of the study area.

Economic Background

The whole region, particularly the Athabasca Basin area, is currently being explored by numerous companies looking primarily for uranium. The principal target for exploration is the sub-Athabasca unconformity surface in both the Wollaston and Mudjatik domains. It has been realised from the numerous discoveries in the area that high grade mineralization is concentrated at or near the contact between the sub-Athabasca unconformity and the underlying highly altered metasedimentary rocks (e.g. Midwest Lake, Key Lake, McClean Lake and Dawn Lake deposits). However the thickness of the Athabasca cover rocks varies widely within the area, being of the order of 185 m, 120 m, 150 m, and 160 m at Midwest, Key, McClean and Dawn Lakes respectively.

Structural Control of Ore Deposition

Intensive and extensive geological and geophysical studies conducted over the known ore bodies in the Athabasca Basin indicate a definite relationship between the ore deposition and the structural setting (Ray, 1977, 1978, 1979; Sibbald, 1980; Suryam, 1981). In general most of the ore bodies exhibit the following common disposition:

1) They all occur close to the unconformity at the base of the Athabasca Formation.

2) Most of the ore bodies are elongate, associated with faulted basement structures.

3) Most of the ore bodies are localized along the flanks of the Archean 'Massifs' (Fig 2, p. 8 and Map 1, in pocket), occurring in narrow channels along the edge of the 'Massif' (Suryam, 1981).

Considering the above factors, a suitable exploration strategy in the Athabasca Basin would be the following: — Location of the Archean 'Massifs' below the Athabasca cover rocks, followed by a detailed exploration for the channels fringing the 'Massifs'. Since some of the channels are associated with faulting, detailed mapping of the basement faults would help in de' ing them. Because of the considerable cover, seismic surveys are presently the most effective method of locating and mapping the above targets.

The Seismic Method

The Field Procedure and Instrumentation are described in detail earlier (Suryam, 1981a). Briefly the seismic equipment is a 24-channel refraction unit, used with one mile spread of 24 geophones at 220 ft geophone interval. Two-way shooting was deployed in order to determine the slope as well as depth to the basement surface. The source for the seismic energy was dynamite explosion.

Seismic Results and Interpretations

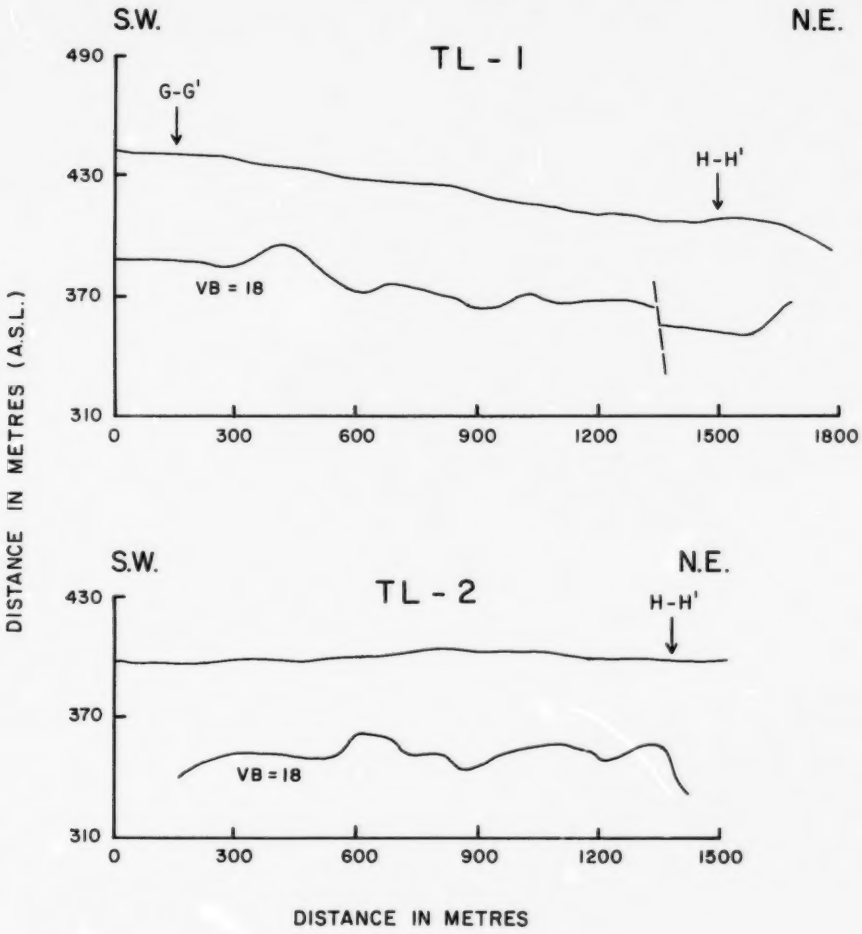
Maps 1 and 2 show the geographically located seismic profiles drawn to show the basement surface in the Southern half and Northern half of the area respectively. Map 1 also shows the outlines of the Archean 'Massifs' located on the basis of the regional seismic survey conducted by the author (Suryam, 1981b) and on the basis of the gradiometer surveys conducted in this part of the area by the Geological Survey of Canada in 1979. The map displays the spatial relationship of the known ore bodies in this area to the distribution of the Archean 'Massifs' and the edge of the Athabasca Basin. In general most of the ore bodies seem to occur close to the outlines of the Archean 'Massifs'. For example, Gulf's Eagle Point, Collins Bay 'A' Zone, and Collins Bay 'B' Zone are all situated close to the eastern flank of the Harrison 'Massif', and Asamera's McClean Lake North and South ore zones are situated close to the Northwest flank of McClean 'Massif'. Further, all the above ore bodies seem to occur in structural lows (channel like features on the surface of basement) fringing the edges of the Archean 'Massifs' (see seismic profiles, I-I', and H-H' in the case of Eagle Point and 'B' Zones).

The structural low associated with the McClean Lake ore bodies is shown in an earlier study (Suryam, 1981b).

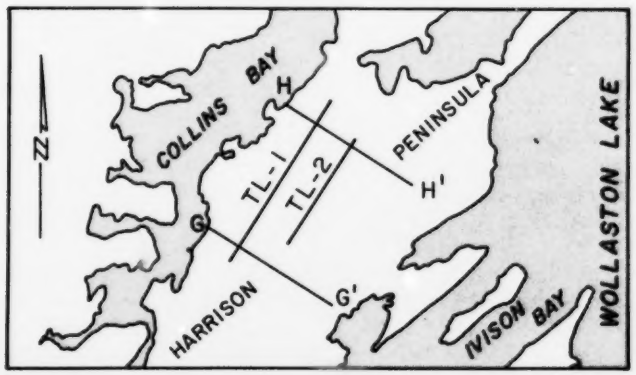
Based on the above observations, a line by line discussion on the geological interpretation and possible economic interest of each seismic profile from A-A' to Z1-Z1' (Maps 1 and 2) is presented in Table 2 (p. 12).

Tie Lines TL-1 and TL-2

In the Collins Bay area, two tie-lines TL-1 and TL-2 were shot across the profiles G-G' and H-H' (Map 1, in pocket, and detail below), with a view to obtaining more detailed information regarding the subsurface at this location. This is close to the recent Gulf discovery, the ore zone "B" (Map 1). Due to the over crowded nature of the profiles in this area, the results of the tie-lines are shown separately below.

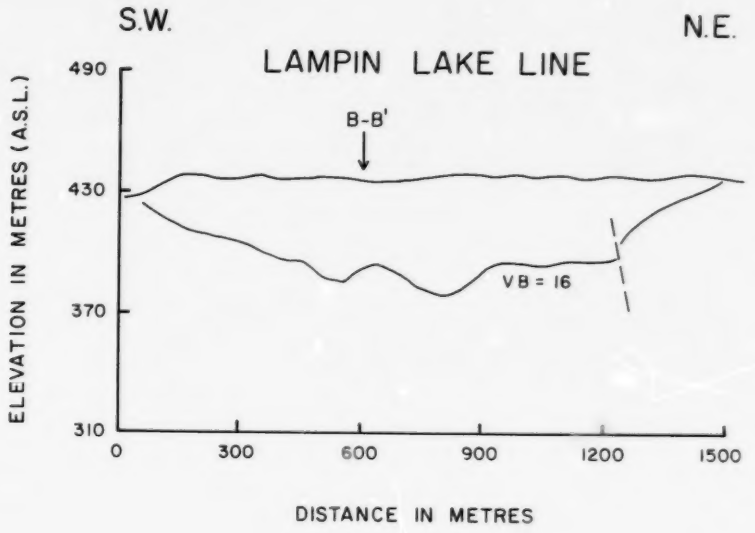


LOCATION MAP



Lampin Lake Cross-line

A cross-line trending SW-NE was shot across the profile B-B' in the region between Lampin and East Lampin Lakes (Map 1, in pocket, and detail below). A considerable gap exists in the profile B-B' in this region due to the presence of the two lakes, but the gap itself is not wide enough to accommodate the one-mile long seismic spread. Hence the gap is covered by shooting the one-mile long spread along the longer dimension, that is at right angles to B-B'. The results of the cross-line are shown below.



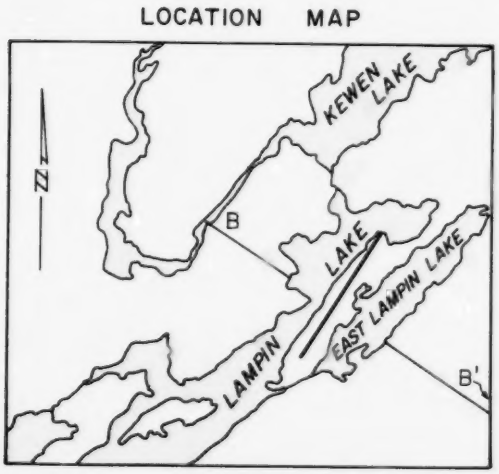


Table 2 — Notes on the Seismic Profiles (Refer to Maps 1 and 2)

Profile	Geological Setting	Suggested Target No.	Prospective Characteristics
AA'	Situated on the Wollaston Belt.	1	Close to the edge, thrust fault, similar to Rabbit Lake deposition.
		2	Basement low formed by faulting.
BB'	Situated on the Wollaston Belt.	1	Close to the edge, basement low, faulting.
CC'	Situated on the Wollaston Belt.	1	Close to the edge, fault.
		2	Basement fault forming a low.
DD'	This profile forms a segment of the regional seismic profile that was shot across the Athabasca Basin extending westwards from the western shores of Lake Athabasca (Point D') to Pasfield Lake (Loc. NTS 64-E-1) for a distance of about 120 km, connecting the ore bodies at Rabbit Lake, McClean Lake and Midwest Lake. The results of the regional survey were published earlier (Suryam, 1981b).		
EE'	Situated on Wollaston Belt, and outside the edge.	None	None.
FF'	Situated in Wollaston domain, close to the edge, crosses the Harrison 'Massif'.	1	Fault, basement low, close to the fringe of the Harrison 'Massif'. Similar situation to Eagle Point, Collins Bay 'A' and 'B' zones.
GG'	Ditto	1	Ditto
HH'	Ditto	1	Collins Bay 'B' zone itself.
II'	Ditto	1	Fault, basement low, close to the fringe of Harrison 'Massif', close to Eagle Point ore body.
		2	Fault, basement low, close to the edge, close to the Northwestern flank of the Harrison 'Massif' dome, similar in situation to McClean Lake ore bodies.
JJ'	Situated in the Mudjatik domain.	1	Basement fault, low, close to the edge.
KK'	Ditto Line runs almost parallel to the edge.	1, 2, 3, 4, 5, 6 and 7	Basement fault, low, close to the edge, close to exposed Aphebian rocks which are mainly the host rocks for uranium mineralization at Rabbit Lake, Key Lake, etc.
LL'	Situated in Mudjatik domain, close to edge.	1, 2, 3, 4 and 5	Close to edge, basement lows, faulting.
MM'	Ditto	1, 2, 3	Close to edge, faults, basement low.

Profile	Geological Setting	Suggested Target No.	Prospective Characteristics
NN'	Ditto	1	Fau ose to edge.
OO'	Ditto	1, 2	Considerable basement low, close to edge.
PP'	Ditto	1	Basement fault, low, close to edge.
QQ'	Ditto	1	Ditto
RR'	Ditto	1	Faulted basement low, close to edge.
SS'	Ditto	1	Ditto
TT'	Ditto	None	None
UU'	Ditto	1	A broad basement low, faulting, close to the edge.
VV'	Ditto	1	Basement low, fault, close to edge.
WW'	Ditto	1	Ditto
XX'	Ditto	1	Ditto
YY'	Ditto	1	A narrow channel-like feature, fault, close to edge.
ZZ'	Ditto	1	A basement low, faulting, close to the edge.
Z1Z1'	Ditto	1, 2	Basement low, faulting, close to the edge.

Conclusions and Recommendations

The suggested targets listed under Table 2 are worth pursuing for further detailed exploration or drilling. However, it is not possible at present to assign target priorities since the exploration history of the Northern half of the area covered has not matured to the same extent as that of the Southern half. Until such time as discoveries are reported from the Northern half of the area, it is difficult to assess the relative importance of each half.

Bibliography

Cameron, E. M. and Sibbald, T. I. I., (1980): NEA/IAEA Athabasca Basin Text Area Program; in Christopher and Macdonald (eds.) Summary of Investigations 1980, Saskatchewan Geological Survey, Misc. Rept. 80-4.

Darnley, A. G. *et al.* (1975): The Distribution of Uranium in Rocks as Guide to the Recognition of Uraniferous Regions. Paper presented at the International Atomic Energy Agency, Vienna.

Gabelman, J. W., (1977): Migration of Uranium and Thorium — Exploration Significance. The American Association of Petroleum Geologists, Studies in Geology No. 3; Tulsa, Oklahoma.

Knipping, H. D., (1974): The Concepts of Supergene versus hypogene emplacement of uranium at Rabbit Lake, Saskatchewan, Canada. Paper presented at the International Atomic Energy Agency Symposium, "Formation of uranium ore deposits" Athens, 1974.

Musgrave, A. W. (ed.), 1967: Seismic Refraction Prospecting: The Society of Exploration Geophysicists, Tulsa, Oklahoma.

Ramaekers, P., (1979): Stratigraphy of Athabasca Basin in Christopher and Macdonald (eds.) Summary of Investigations 1979. Saskatchewan Geological Survey, Misc. Rept. 79-10.

Ray, G. E., (1977): The Geology of the Highrock-Key Lake vicinity, Saskatchewan; Sask. Dept. Min. Res. Report No. 197.

Ray, G. E., (1978): Reconnaissance Geology: Wollaston Lake (West) Area in Christopher and Macdonald (eds.) Summary of Investigations 1978, Saskatchewan Geological Survey, Misc. Rept. 78-10.

Ray, G. E., (1979): Reconnaissance Bedrock Geology, Wollaston Lake East in Christopher and Macdonald (eds.) Summary of Investigations 1979, Saskatchewan Geological Survey, Misc. Rept. 79-10.

Sibbald, T. I. I., (1980): NEA/IAEA Test Area: Sub-Athabasca Group basement Geology; in Christopher and Macdonald (eds.) Summary of Investigations 1980, Saskatchewan Geological Survey, Misc. Rept. 80-4.

Sibbald, T. I. I., Munday, R. J. C. and Lewry, J. F., (1977): The geological setting of uranium mineralization in Northern Saskatchewan, in Uranium in Saskatchewan, Sask. Geol. Soc., Spec. Pub. 3.

Suryam, J. V., (1981a): Seismic Investigations on the Perimeter of the Athabasca Basin in Northern Saskatchewan (Key Lake-Ryan Lake areas). Sask. Dept. Min. Res. Report. No. 216A.

Suryam, J. V., (1981b): Regional Seismic profile, Athabasca Basin in Christopher and Macdonald (eds.) Summary of Investigations 1981, Saskatchewan Geological Survey, Misc. Rept. 81-4.

Wallis, R. H., (1971): The Geology of Hidden Bay Area, Saskatchewan. Sask. Dept. Min. Res. Rept. No. 137.

Appendix — Profiles showing topography of land surface and sub-Athabasca basement surface.

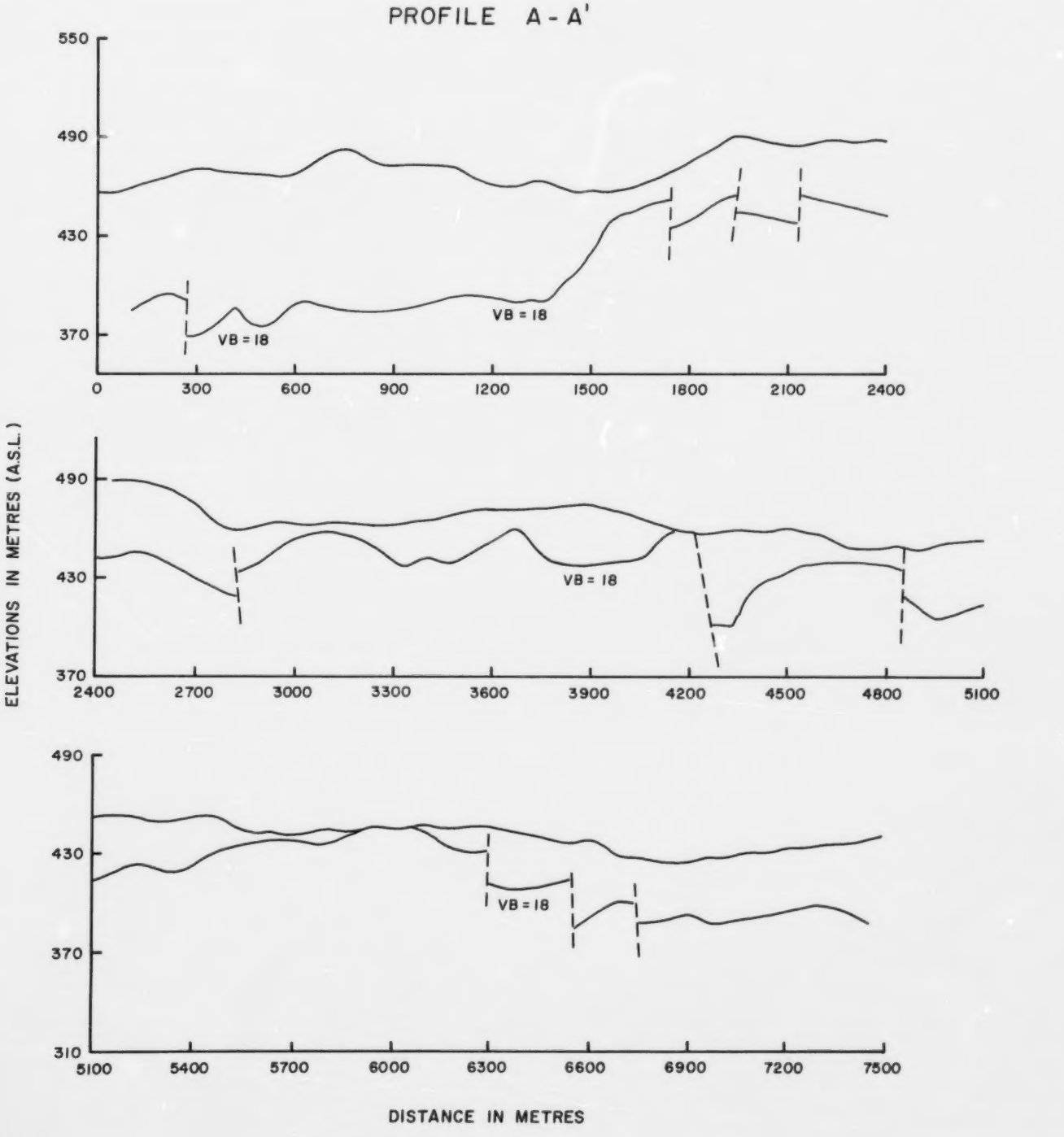
Profile locations are shown on Maps 1 and 2.

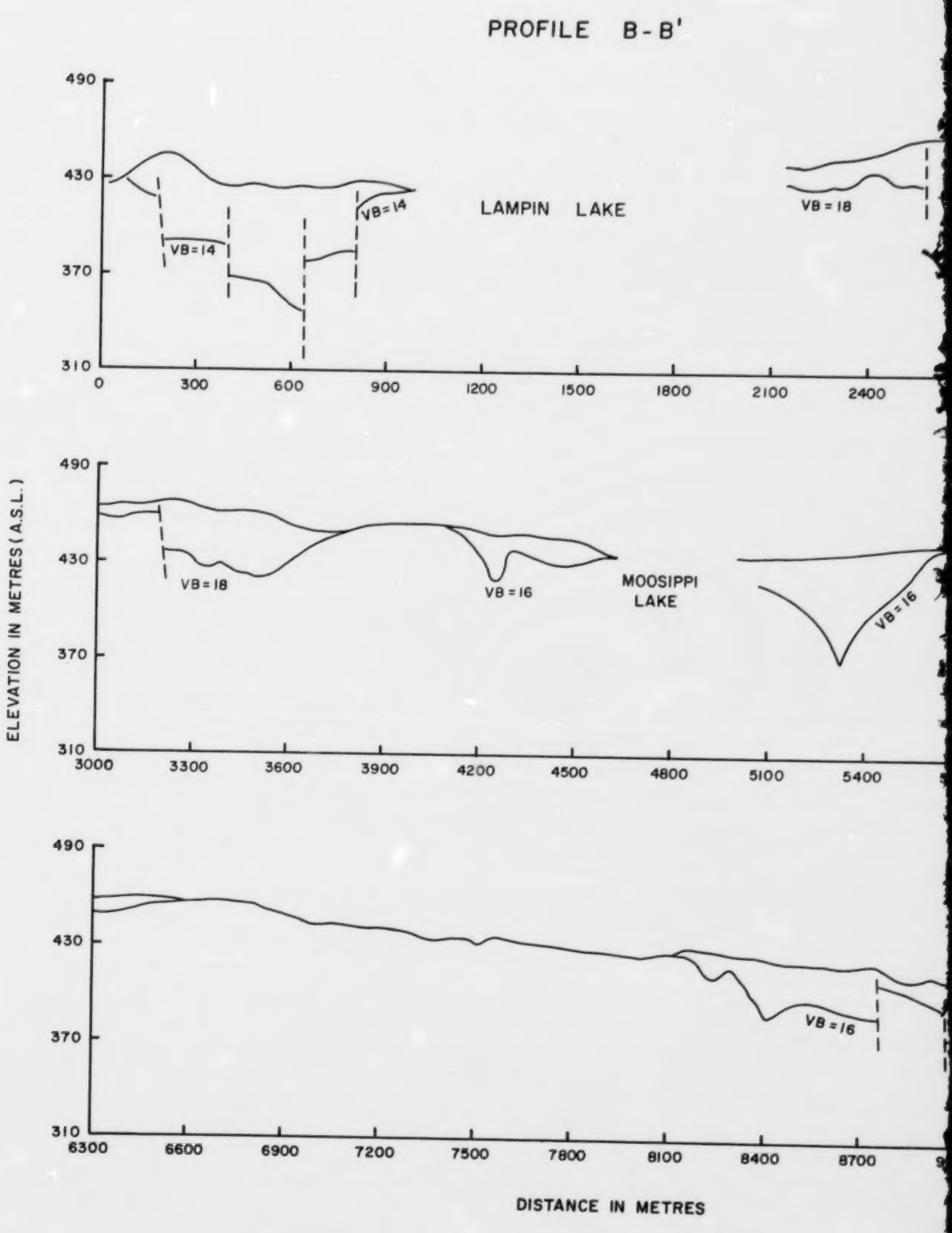
Upper line is topography of land surface.

Lower line shows top of sub-Athabasca basement as calculated from seismic readings.

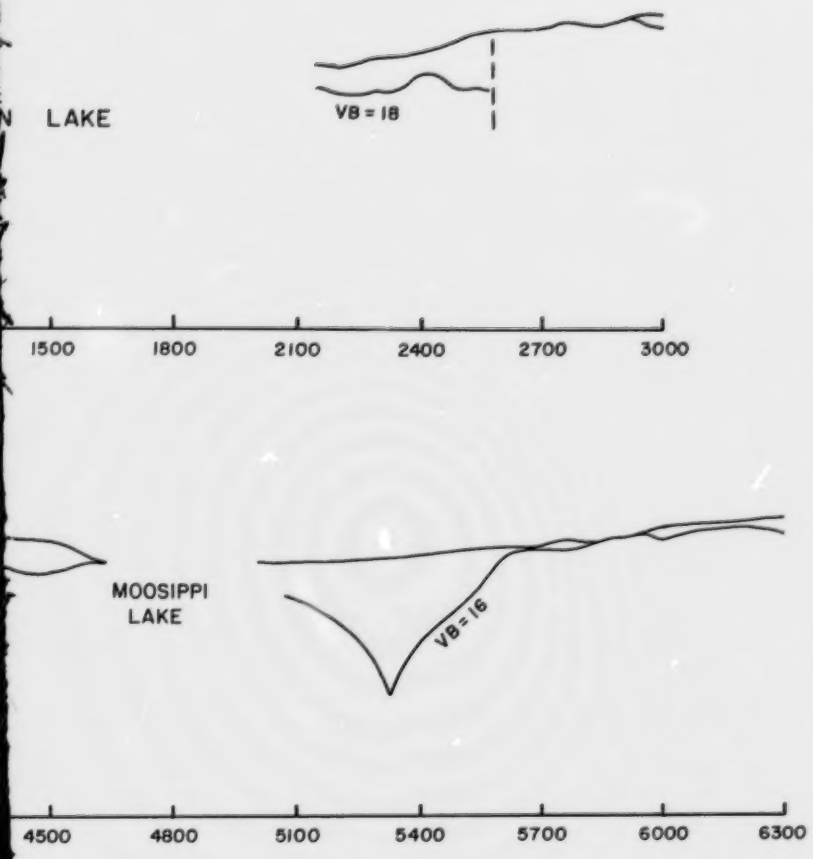
Dashed lines are faults inferred from seismic readings.

VB = Velocity of basement in thousands of feet per second.



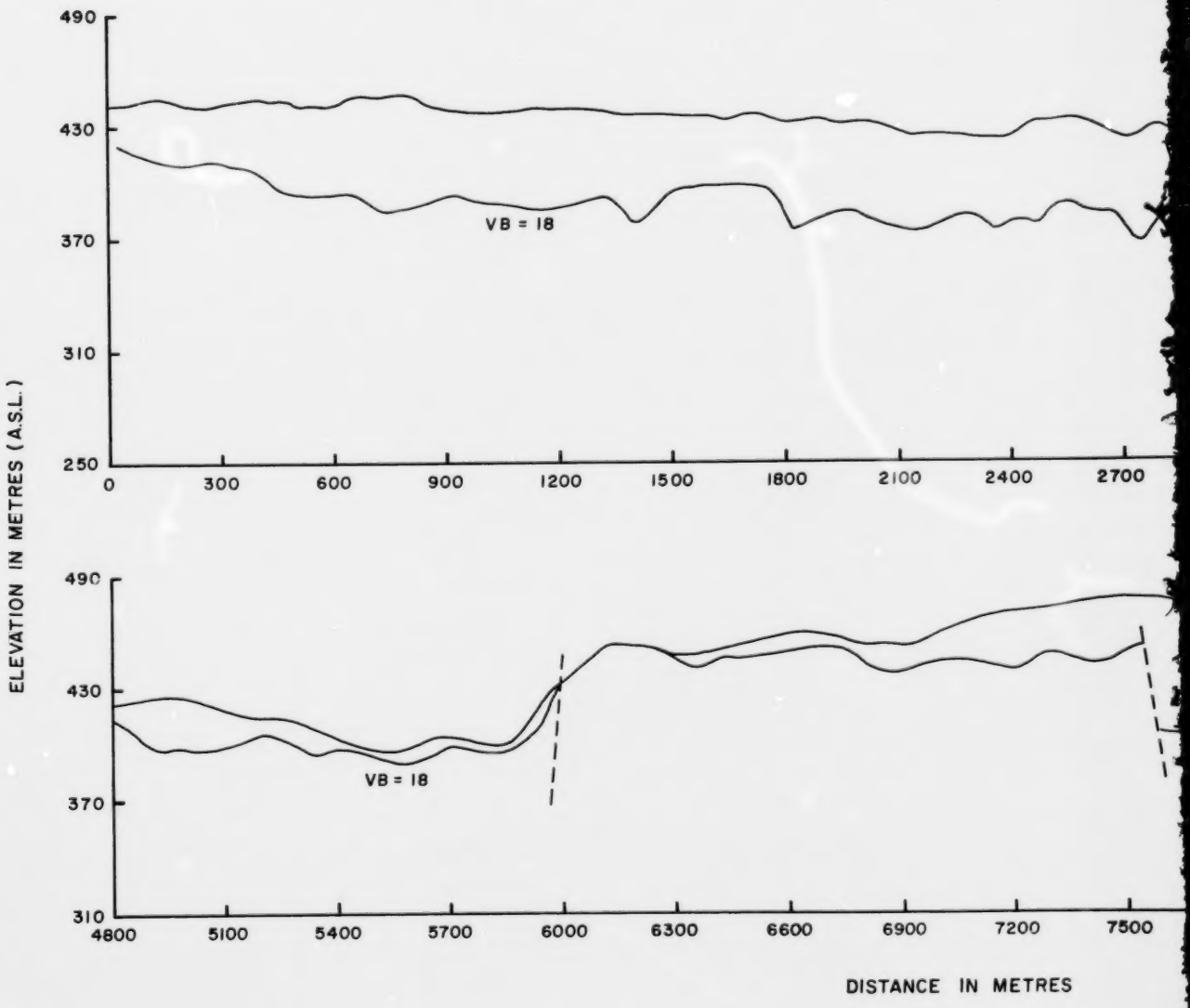

PROFILE B-B'
490
430
370
310
VB=14
VB=14
LAMPIN LAKE
VB=18
0
300
600
900
1200
1500
1800
2100
2400
ELEVATION IN METRES (A.S.L.)
490
430
370
310
VB=18
VB=16
MOOSIPPI LAKE
VB=16
3000
3300
3600
3900
4200
4500
4800
5100
5400
490
430
370
310
VB=16
6300
6600
6900
7200
7500
7800
8100
8400
8700
DISTANCE IN METRES

FILE B-B'

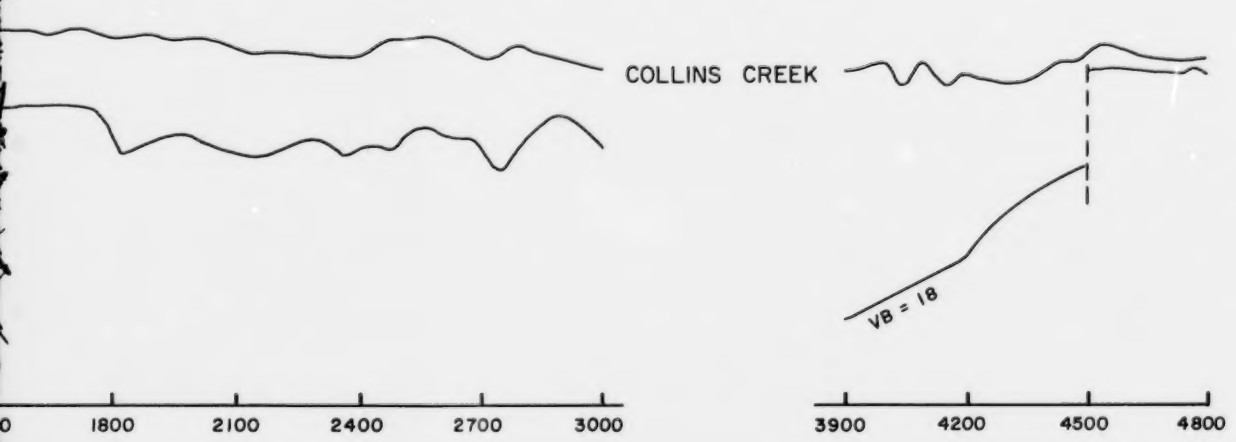


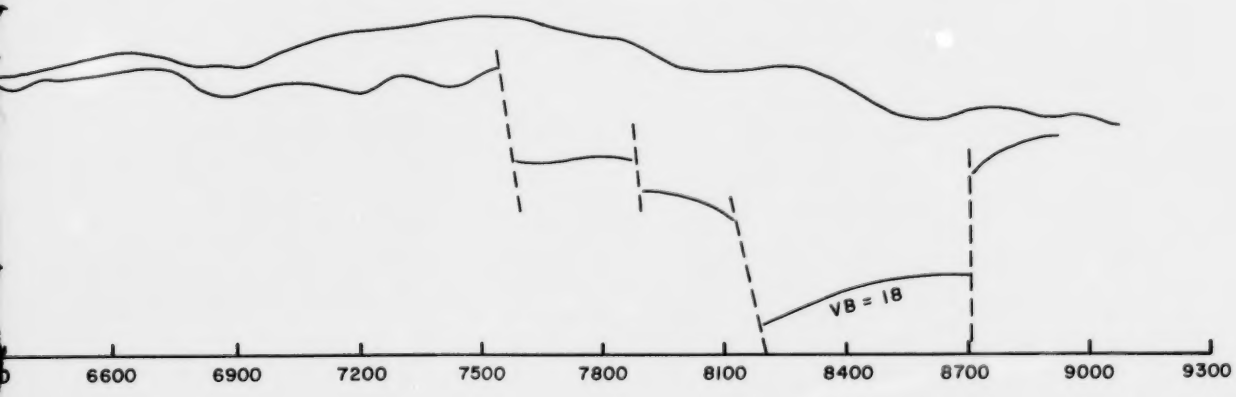
TANCE IN METRES

PROFILE D - D'

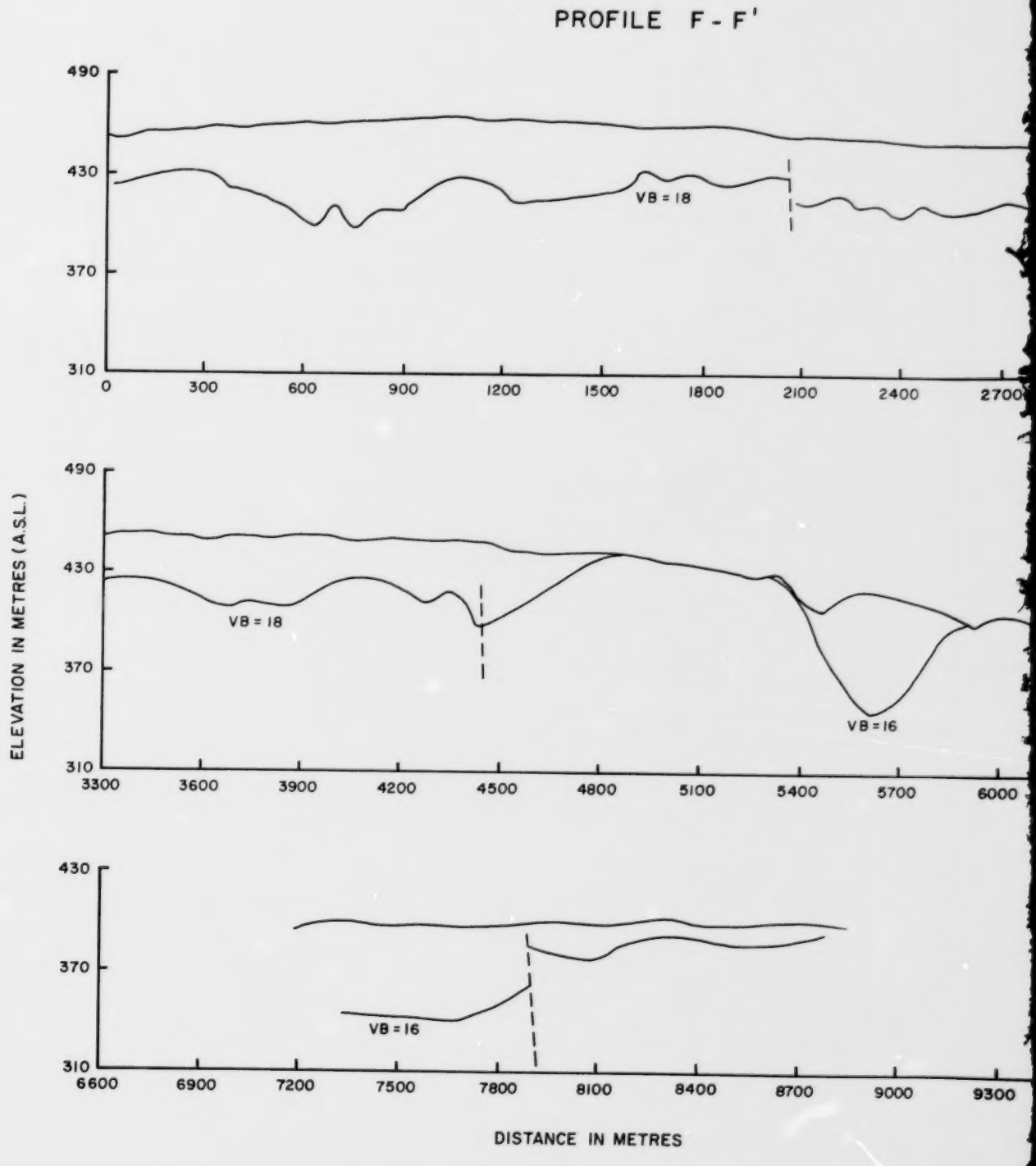

490
430
370
310
250
VB = 18
0
300
600
900
1200
1500
1800
2100
2400
2700
490
430
370
310
VB = 18
4800
5100
5400
5700
6000
6300
6600
6900
7200
7500
ELEVATION IN METRES (A.S.L.)
DISTANCE IN METRES

PROFILE D - D'

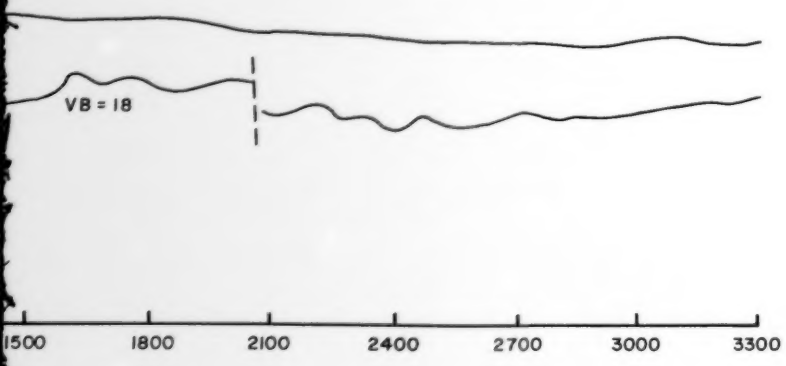


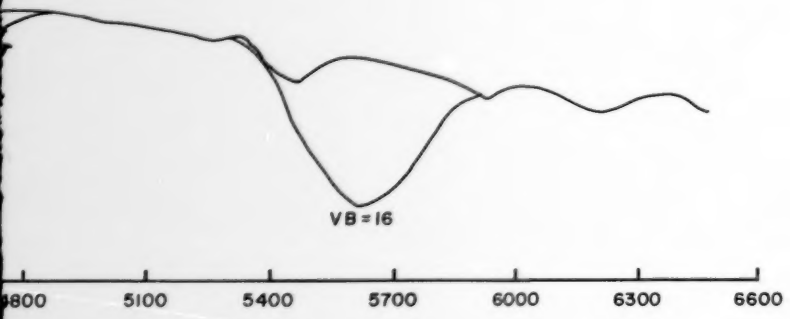


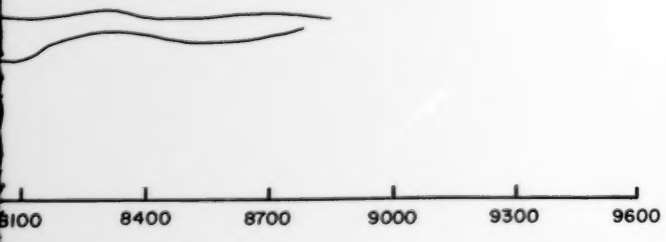
DISTANCE IN METRES


PROFILE F - F'
490
430
370
310
0
300
600
900
1200
1500
1800
2100
2400
2700
VB = 18
490
430
370
310
3300
3600
3900
4200
4500
4800
5100
5400
5700
6000
VB = 18
VB = 16
ELEVATION IN METRES (A.S.L.)
430
370
310
6600
6900
7200
7500
7800
8100
8400
8700
9000
9300
VB = 16
DISTANCE IN METRES

OFILE F - F'

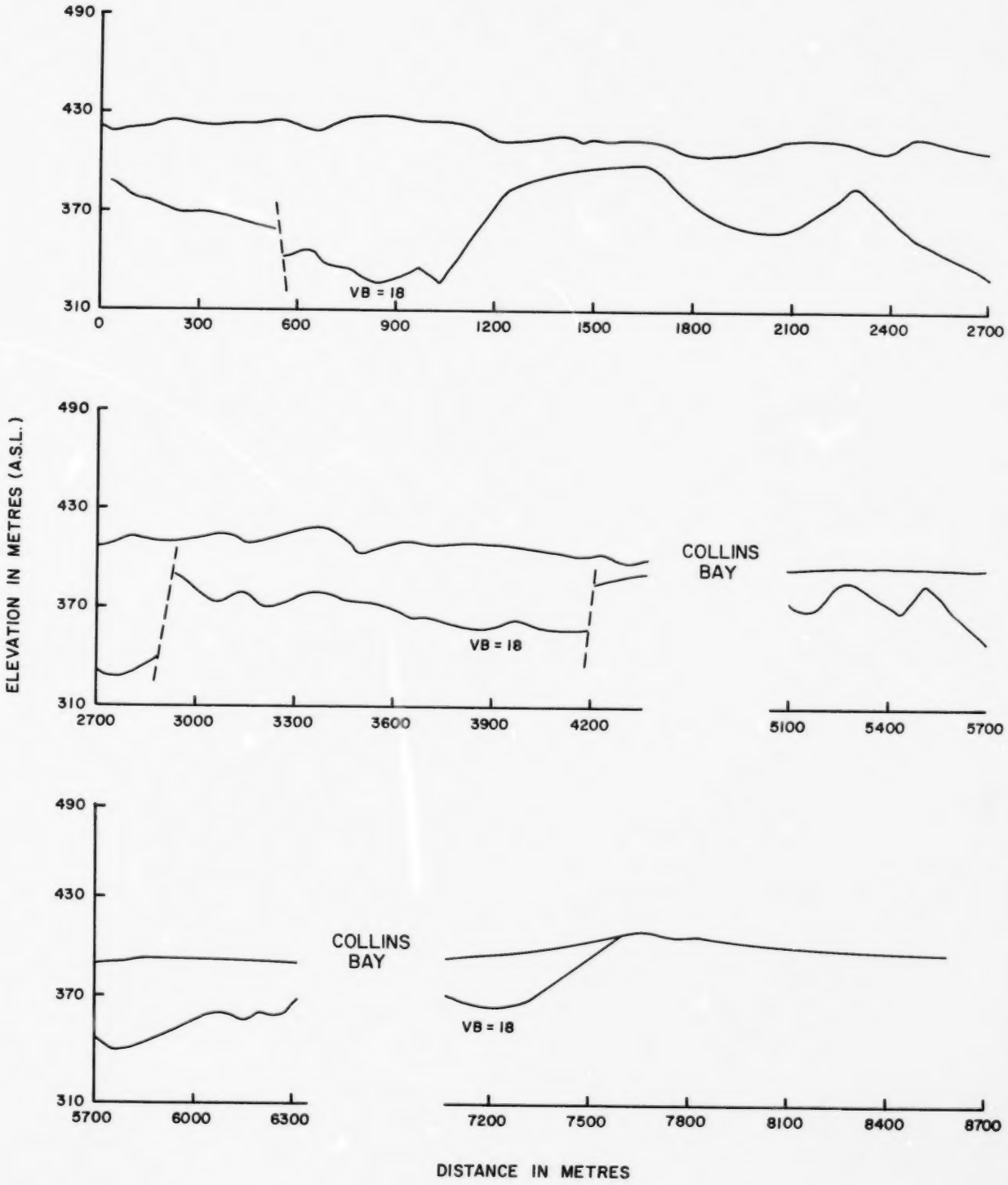




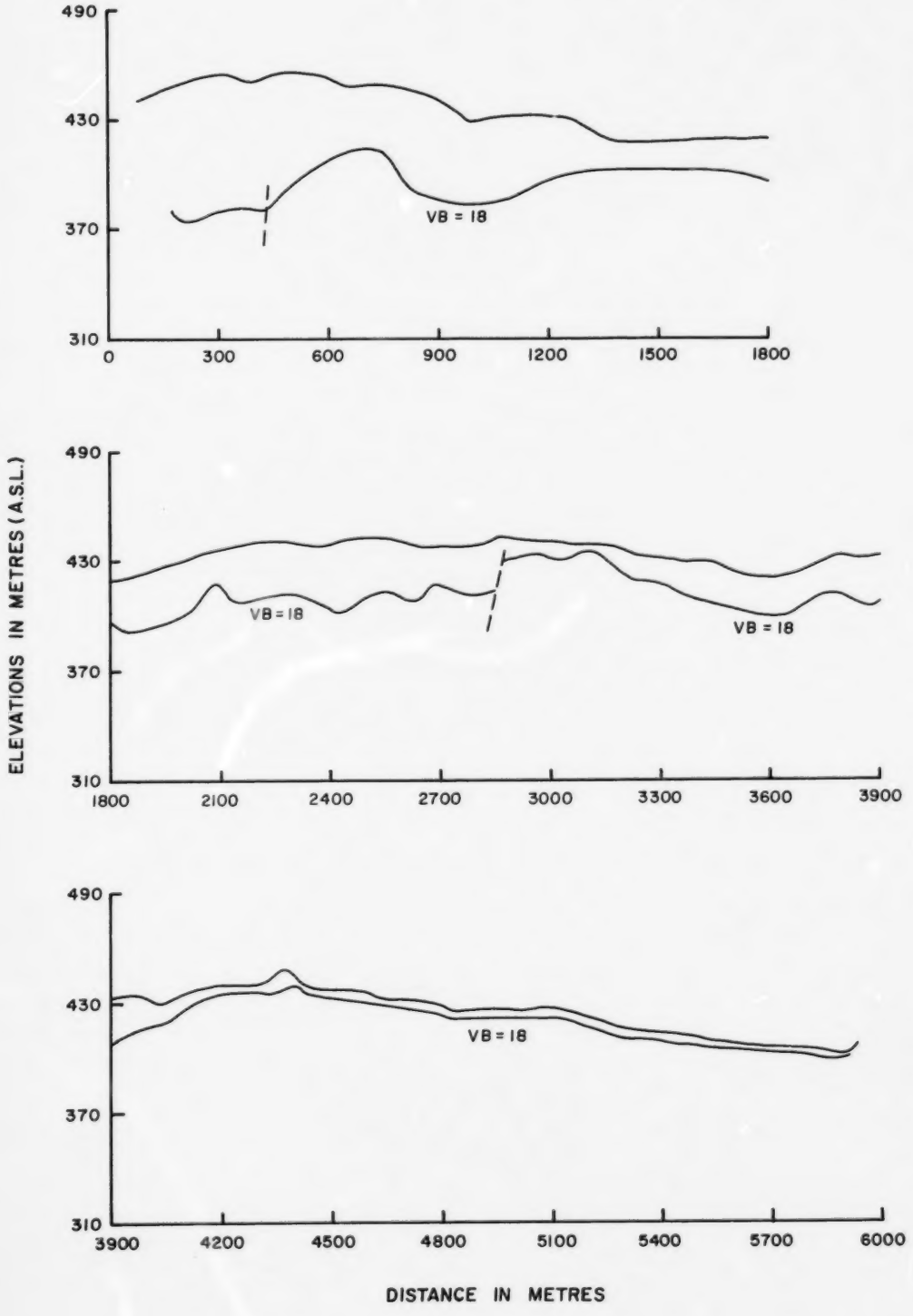


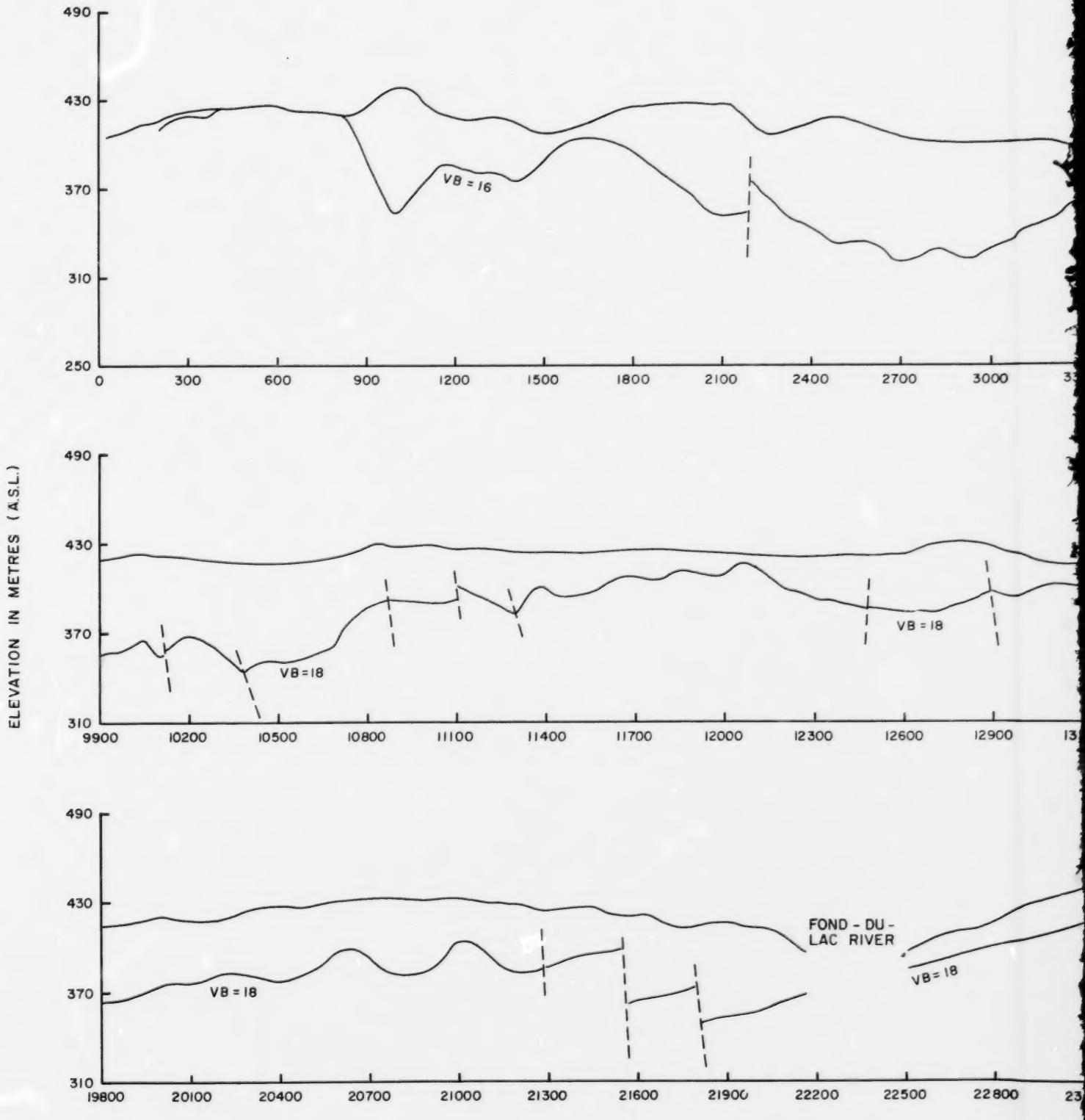
IN METRES

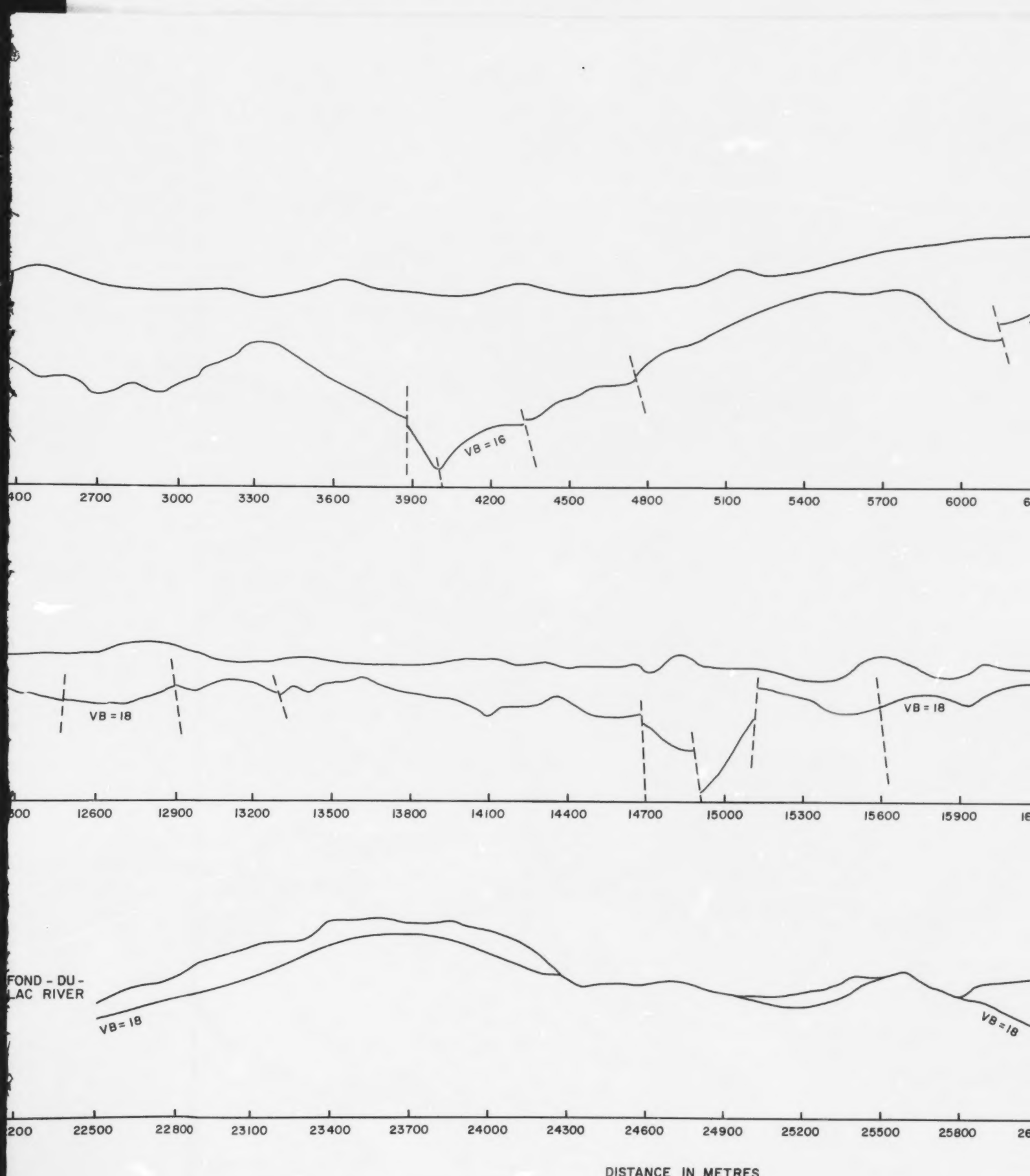
PROFILE 1 - 1'


490
430
370
310
VB = 18
0
300
600
900
1200
1500
1800
2100
2400
2700
ELEVATION IN METRES (A.S.L.)
2700
3000
3300
3600
3900
4200
COLLINS BAY
5100
5400
5700
5700
6000
6300
7200
7500
7800
8100
8400
8700
DISTANCE IN METRES

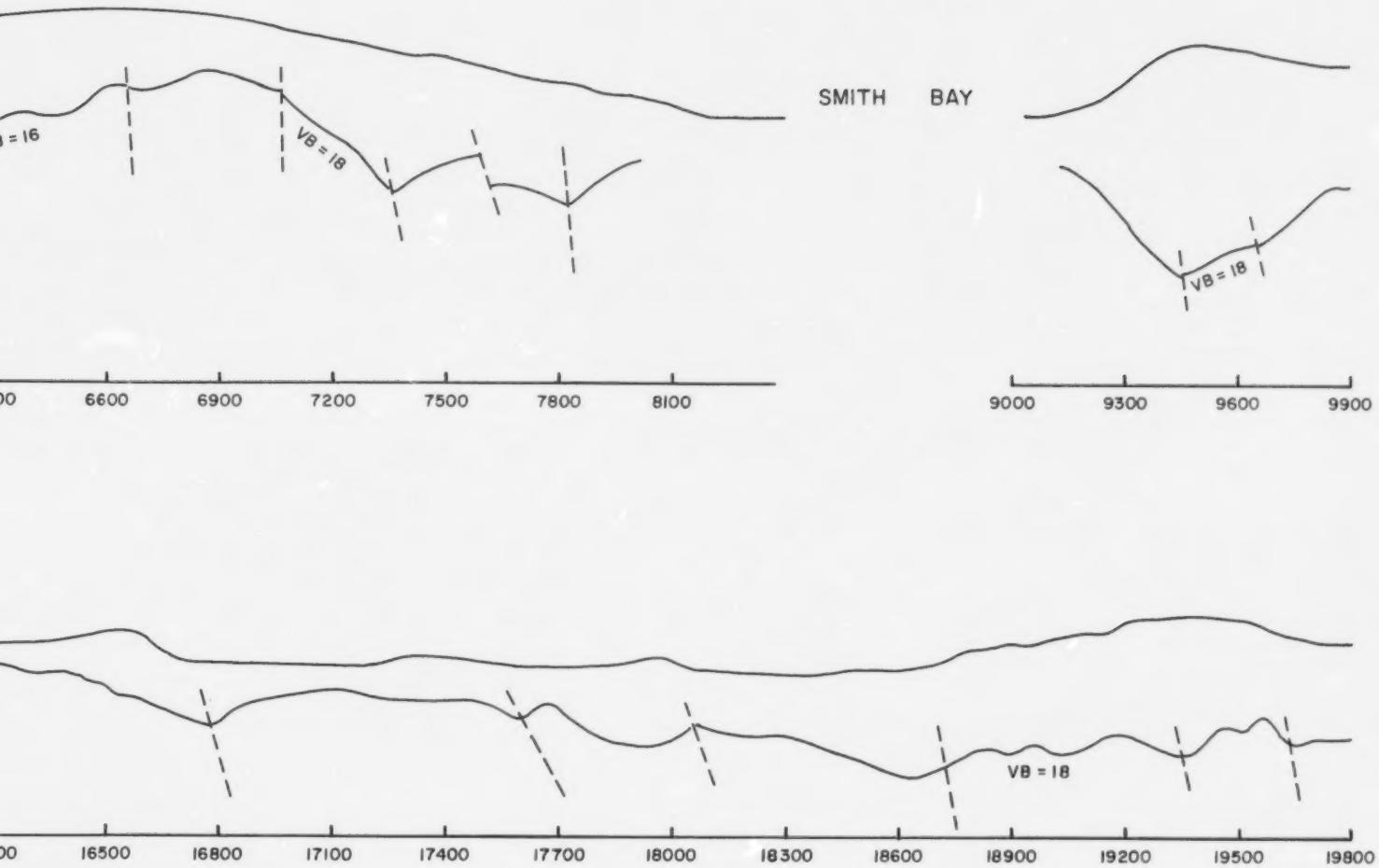
PROFILE J - J'


490
430
370
310
0
300
600
900
1200
1500
1800
VB = 18
490
430
370
310
1800
2100
2400
2700
3000
3300
3600
3900
VB = 18
VB = 18
490
430
370
310
3900
4200
4500
4800
5100
5400
5700
6000
VB = 18
ELEVATIONS IN METRES (A.S.L.)
DISTANCE IN METRES

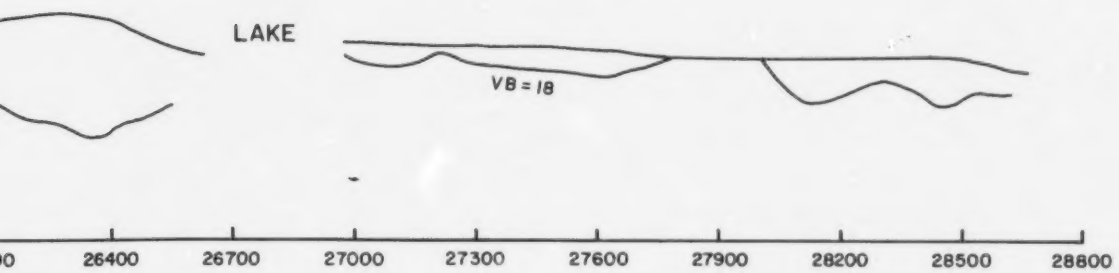

ELEVATION IN METRES (A.S.L.)
490
430
370
310
250
0
300
600
900
1200
1500
1800
2100
2400
2700
3000
VB = 16
490
430
370
310
9900
10200
10500
10800
11100
11400
11700
12000
12300
12600
12900
VB = 18
VB = 18
490
430
370
310
19800
20100
20400
20700
21000
21300
21600
21900
22200
22500
22800
VB = 18
FOND - DU - LAC RIVER
VB = 18

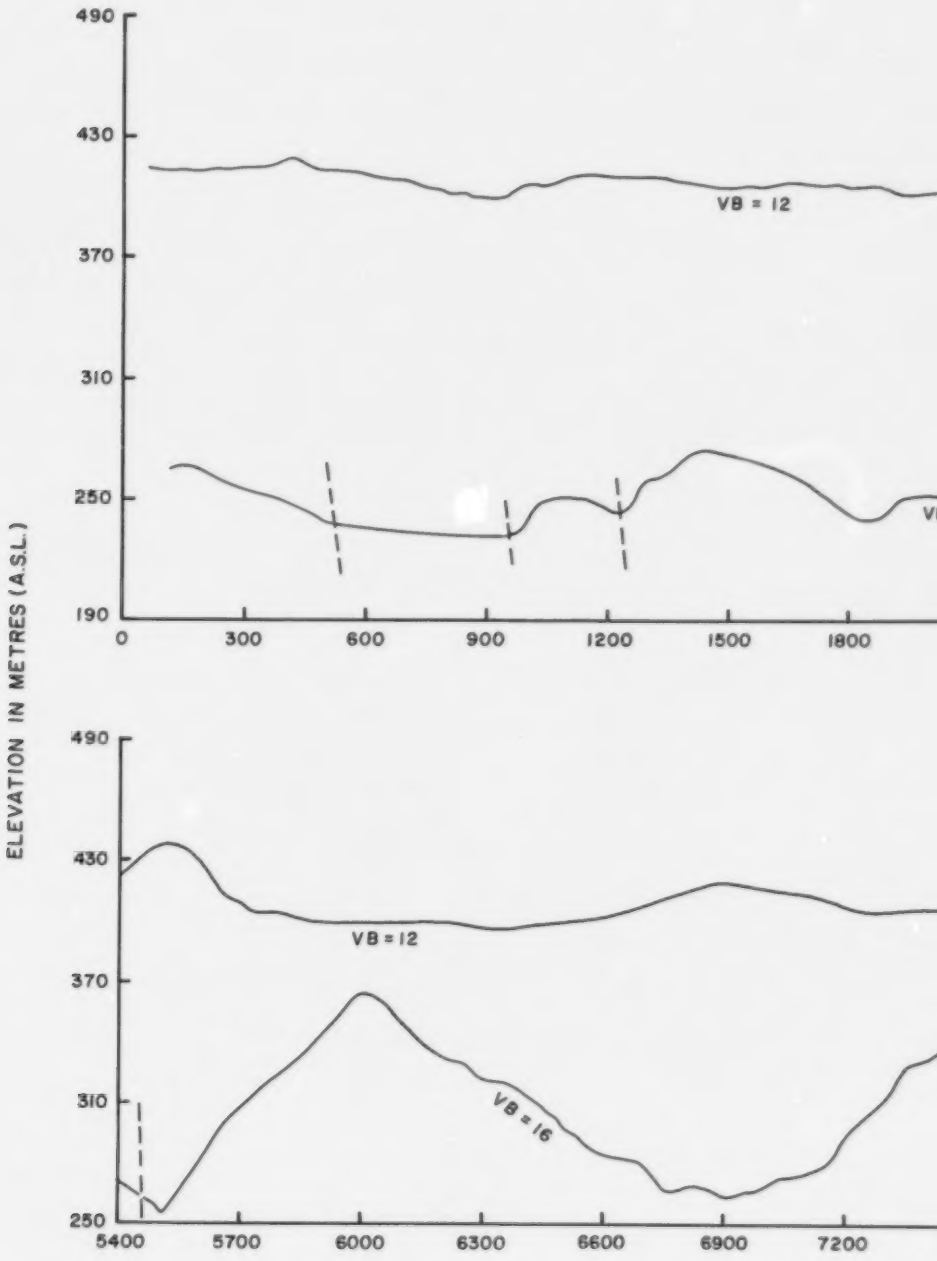

VB = 16
400
2700
3000
3300
3600
3900
4200
4500
4800
5100
5400
5700
6000
VB = 18
VB = 18
300
12600
12900
13200
13500
13800
14100
14400
14700
15000
15300
15600
15900
FOND - DU -
LAC RIVER
VB = 18
VB = 18
200
22500
22800
23100
23400
23700
24000
24300
24600
24900
25200
25500
25800
DISTANCE IN METRES

PROFILE K - K'

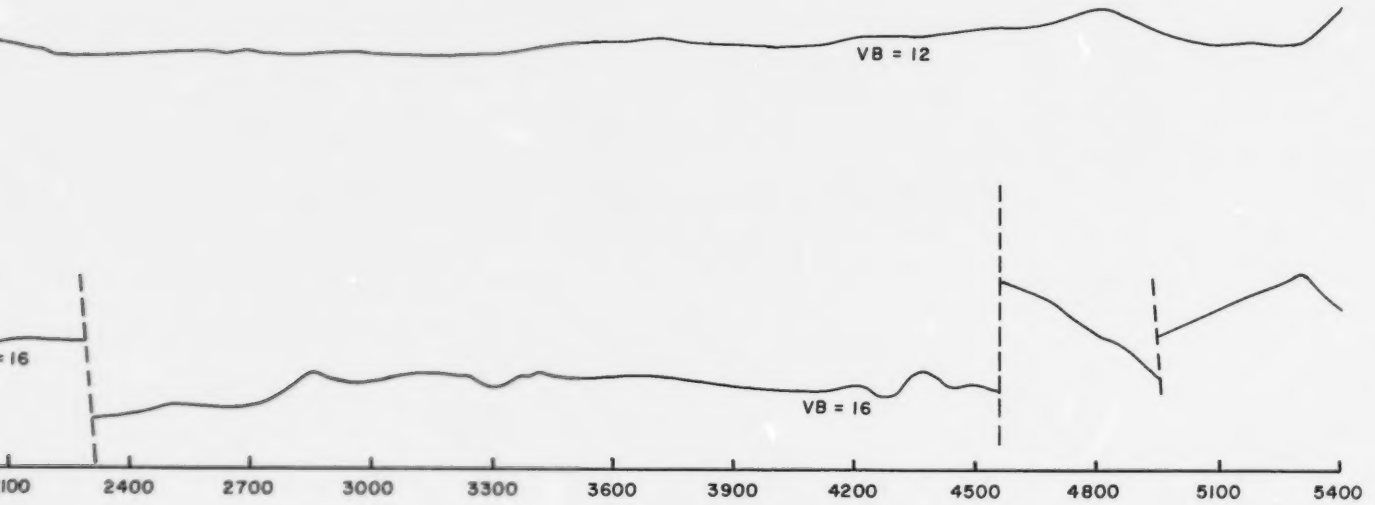

= 16
VB = 18
SMITH BAY
VB = 18
00
6600
6900
7200
7500
7800
8100
9000
9300
9600
9900

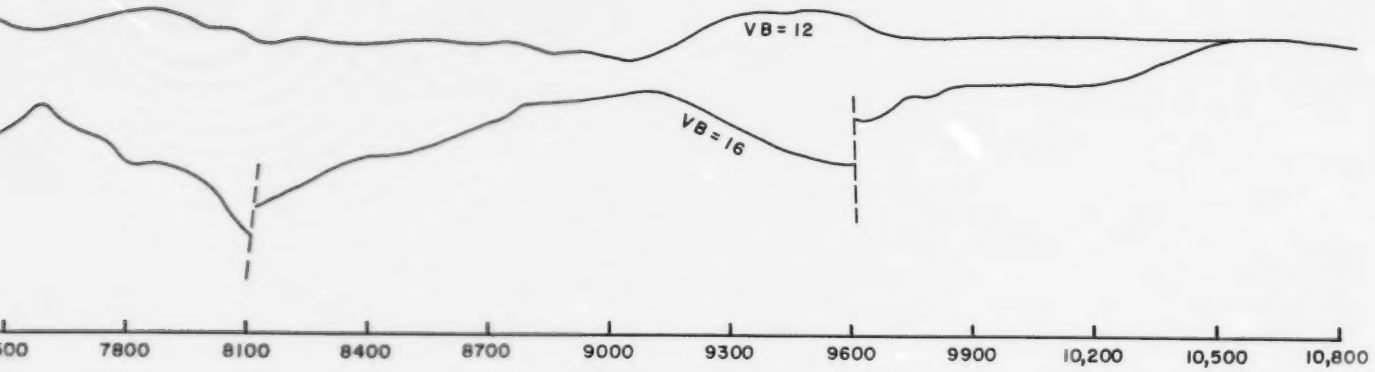
VB = 18
00
16500
16800
17100
17400
17700
18000
18300
18600
18900
19200
19500
19800


LAKE
VB = 18
00
26400
26700
27000
27300
27600
27900
28200
28500
28800


490
430
370
310
250
190
0
300
600
900
1200
1500
1800
VB = 12
ELEVATION IN METRES (A.S.L.)
490
430
370
310
250
5400
5700
6000
6300
6600
6900
7200
VB = 12
VB = 16

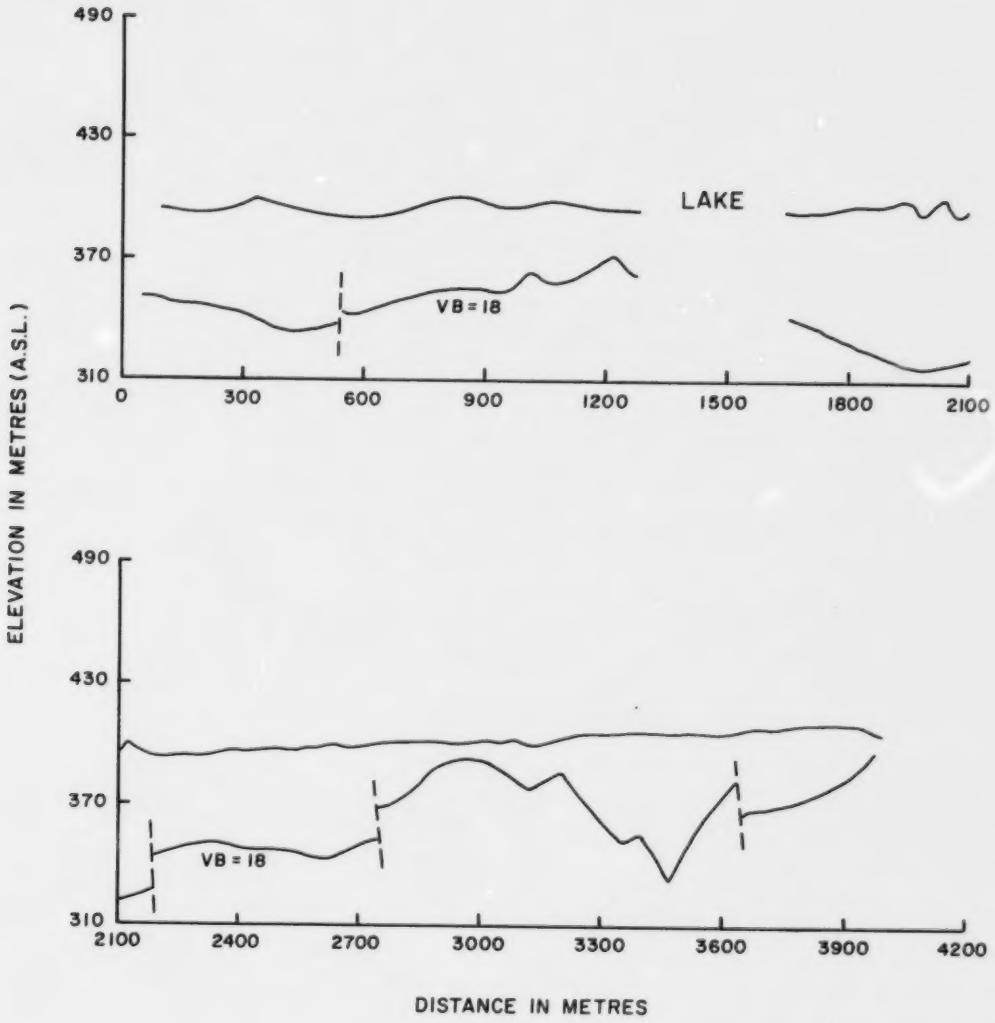
PROFILE L - L'



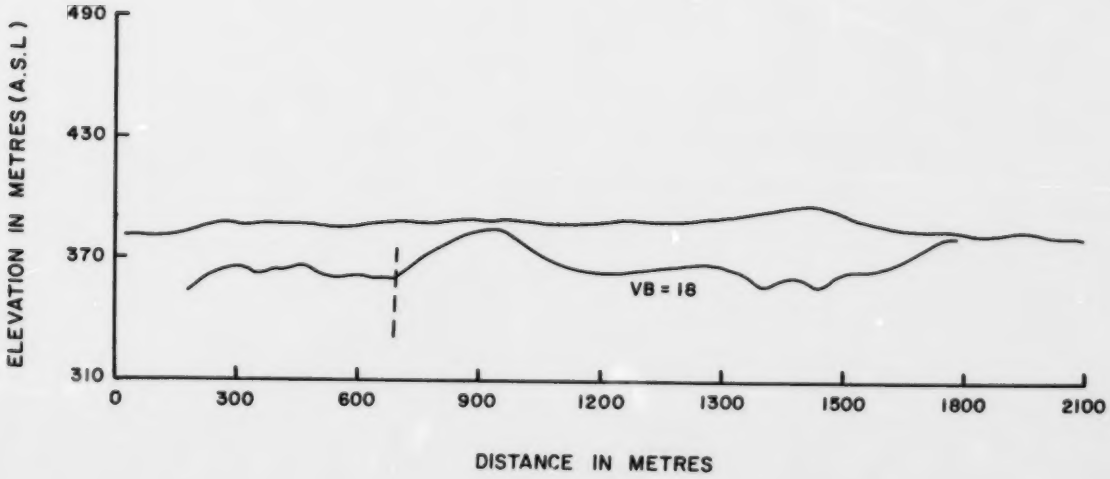


DISTANCE IN METRES

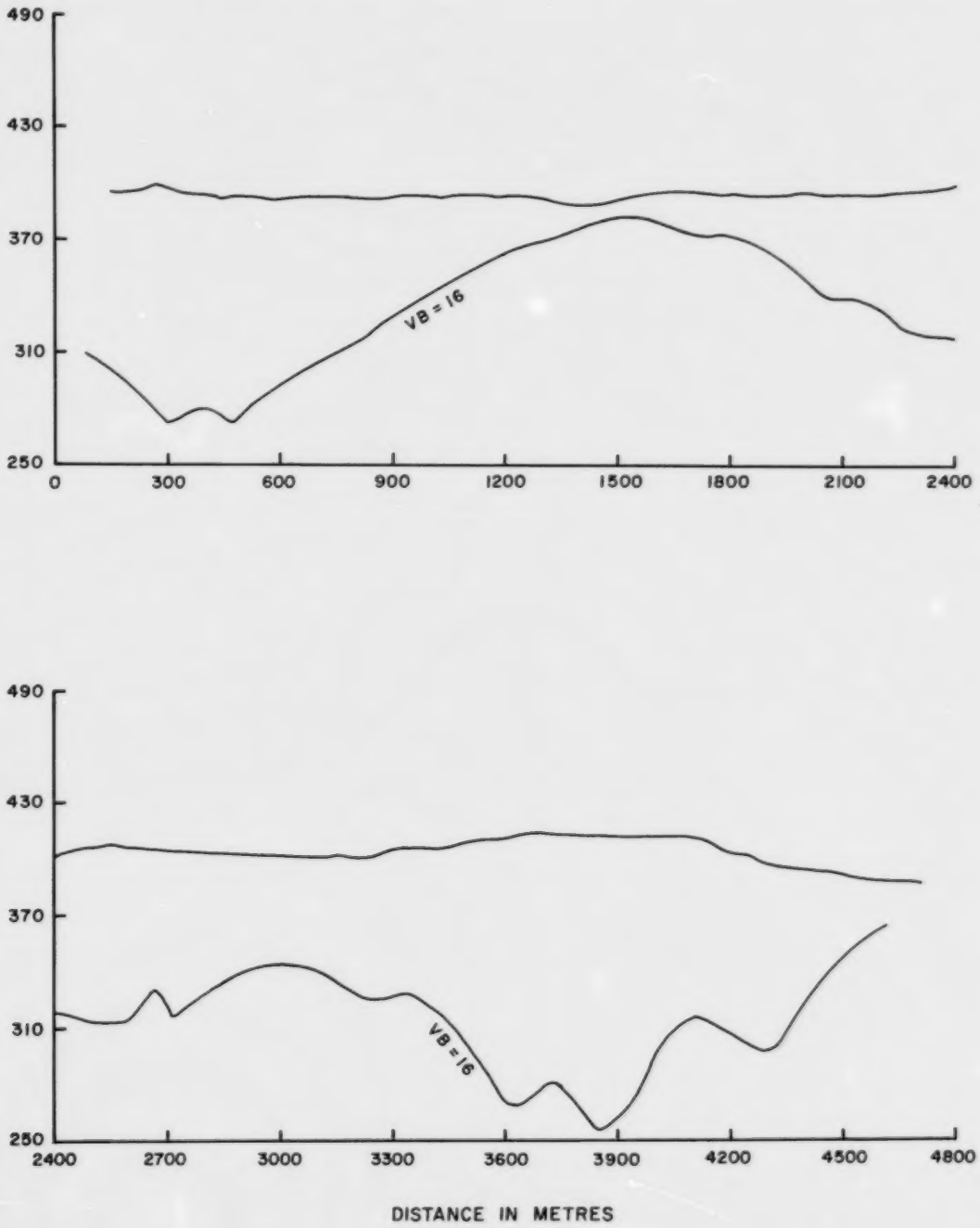
PROFILE M - M'



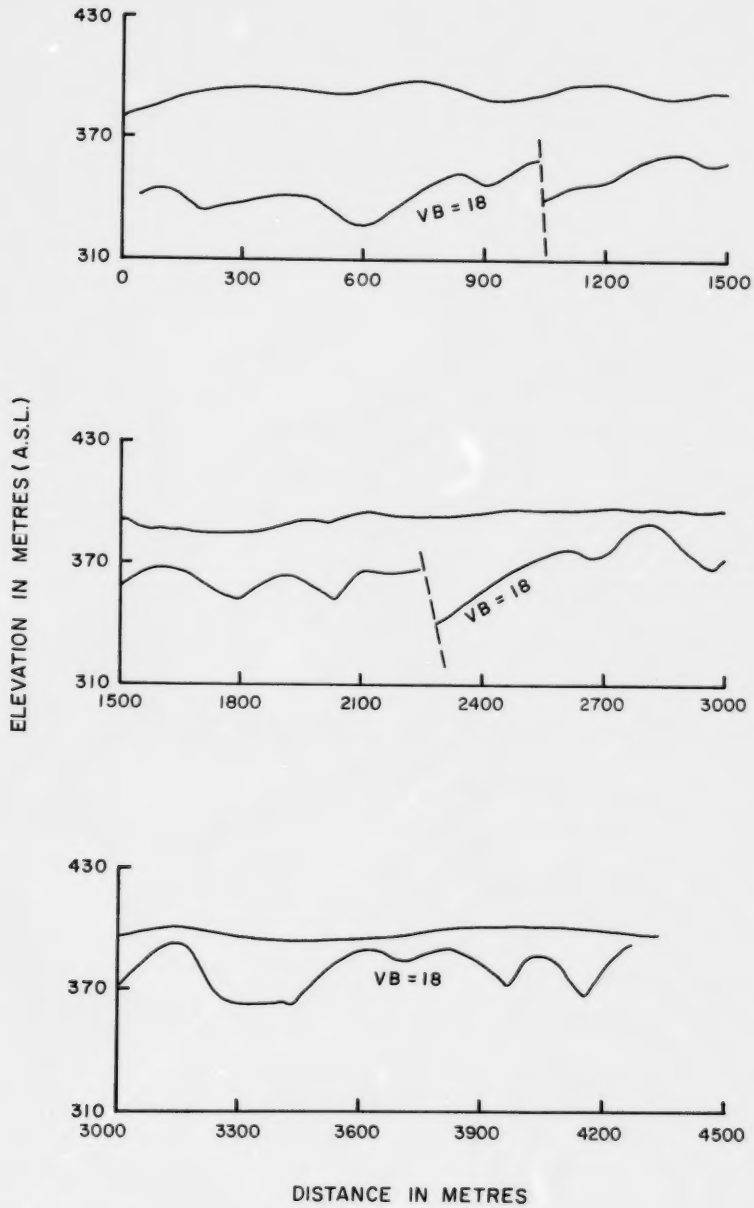
PROFILE N - N'



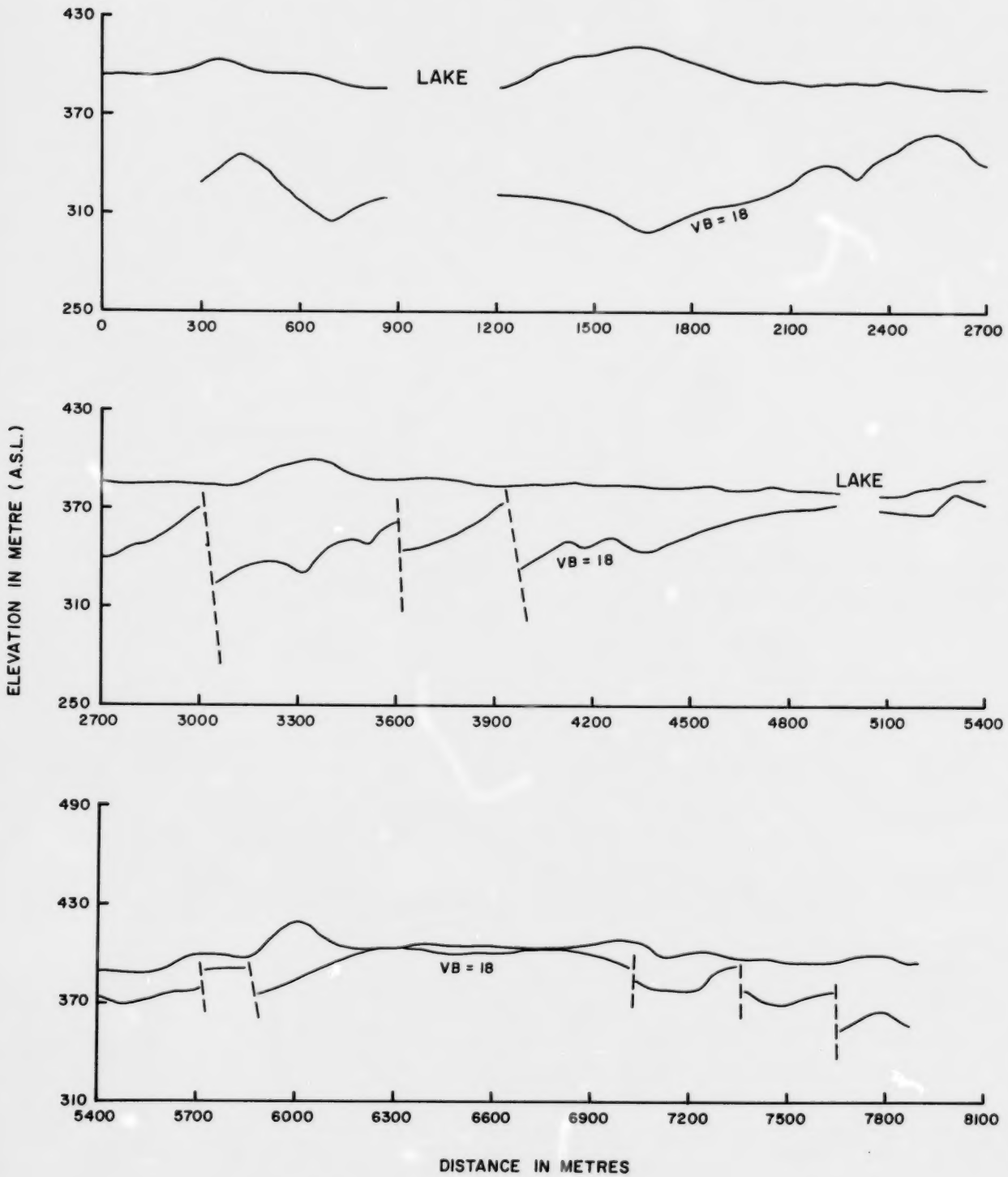
PROFILE O - O'


490
430
370
310
250
0
300
600
900
1200
1500
1800
2100
2400
VB = 16
2400
2700
3000
3300
3600
3900
4200
4500
4800
VB = 16
ELEVATION IN METRES
DISTANCE IN METRES

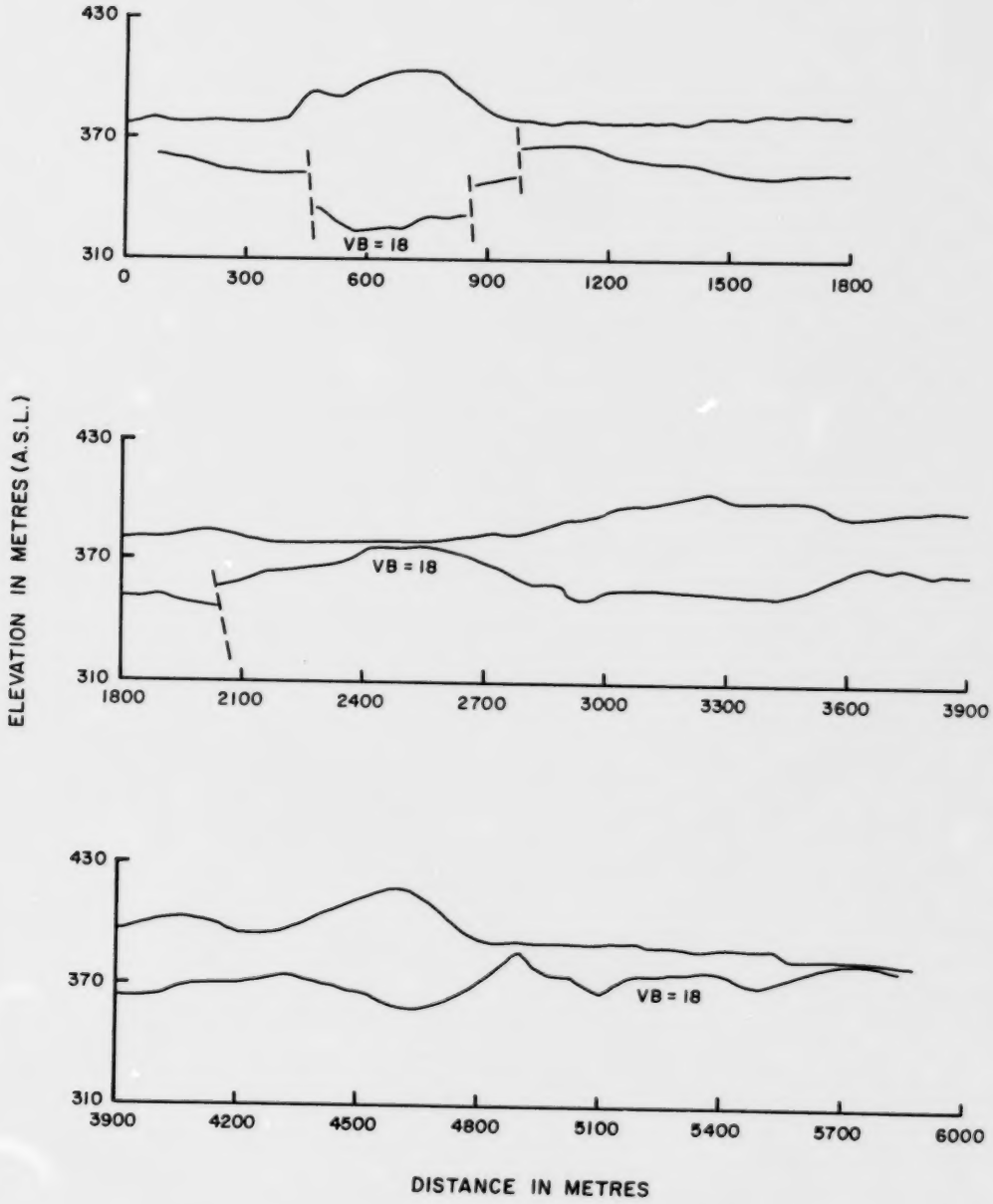
PROFILE P - P'


430
370
310
VB = 18
0
300
600
900
1200
1500
ELEVATION IN METRES (A.S.L.)
430
370
310
VB = 18
1500
1800
2100
2400
2700
3000
430
370
310
VB = 18
3000
3300
3600
3900
4200
4500
DISTANCE IN METRES

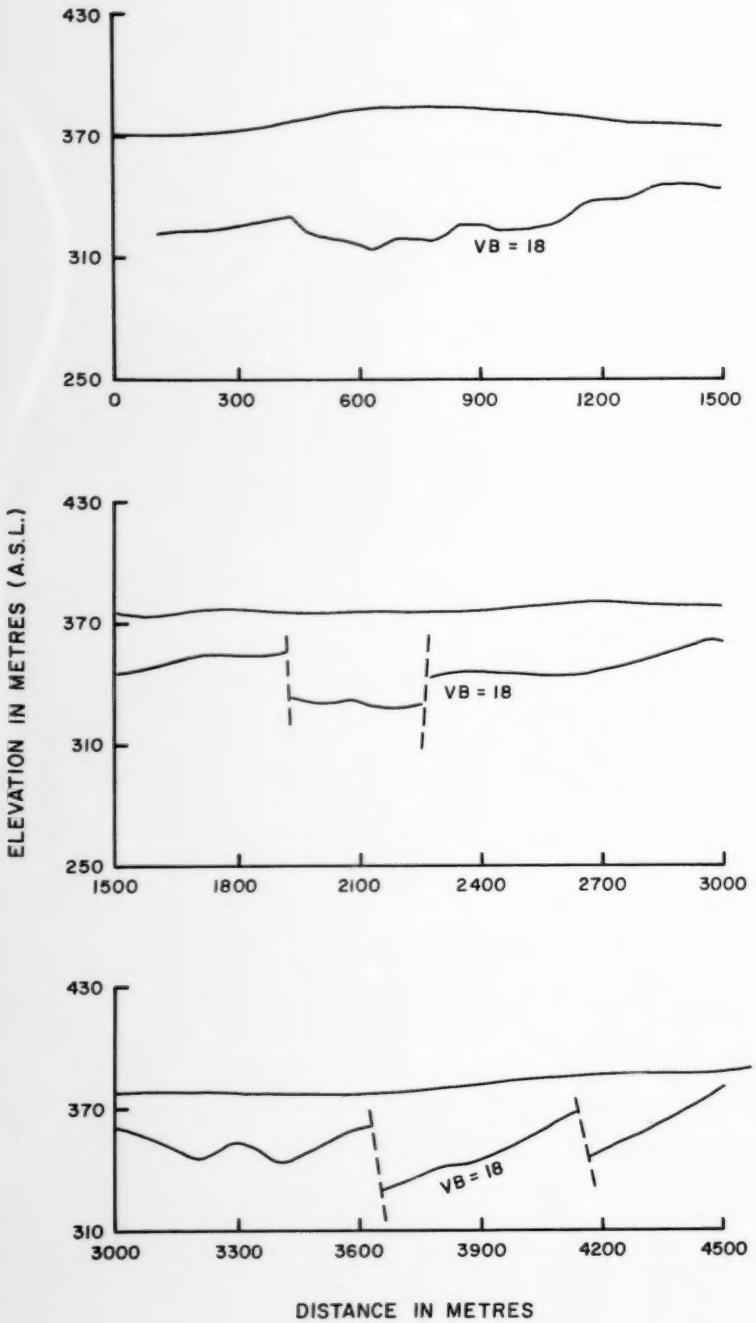
PROFILE Q - Q'


430
370
310
250
LAKE
VB = 18
0
300
600
900
1200
1500
1800
2100
2400
2700
ELEVATION IN METRE (A.S.L.)
LAKE
VB = 18
2700
3000
3300
3600
3900
4200
4500
4800
5100
5400
490
430
370
310
VB = 18
5400
5700
6000
6300
6600
6900
7200
7500
7800
8100
DISTANCE IN METRES

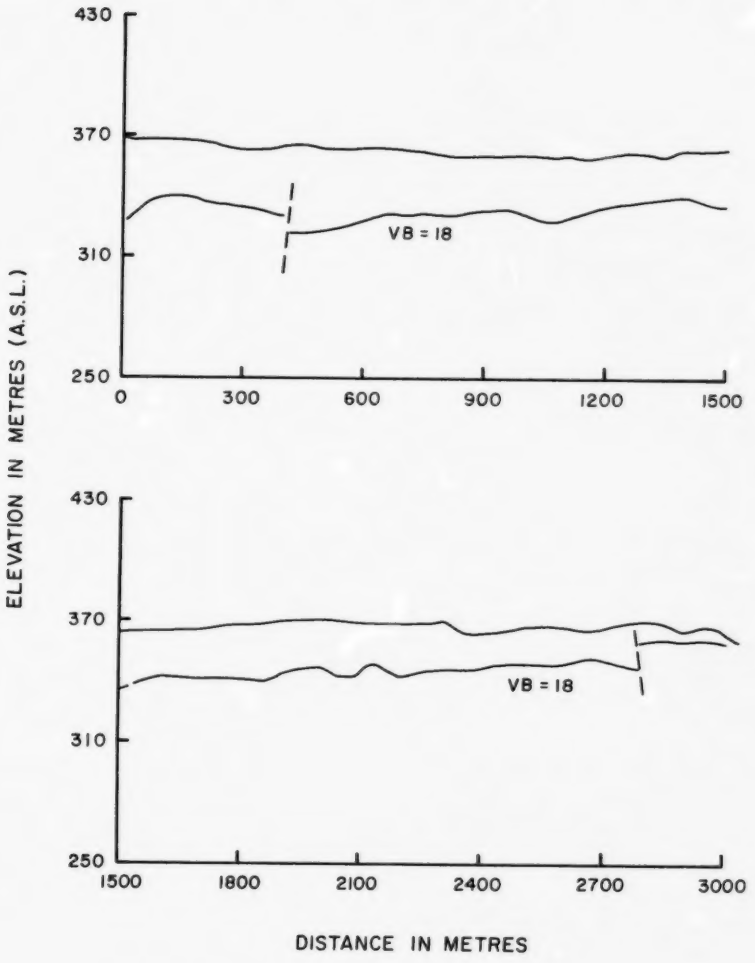
PROFILE R - R'


430
370
310
VB = 18
0
300
600
900
1200
1500
1800
ELEVATION IN METRES (A.S.L.)
430
370
310
VB = 18
1800
2100
2400
2700
3000
3300
3600
3900
430
370
310
VB = 18
3900
4200
4500
4800
5100
5400
5700
6000
DISTANCE IN METRES

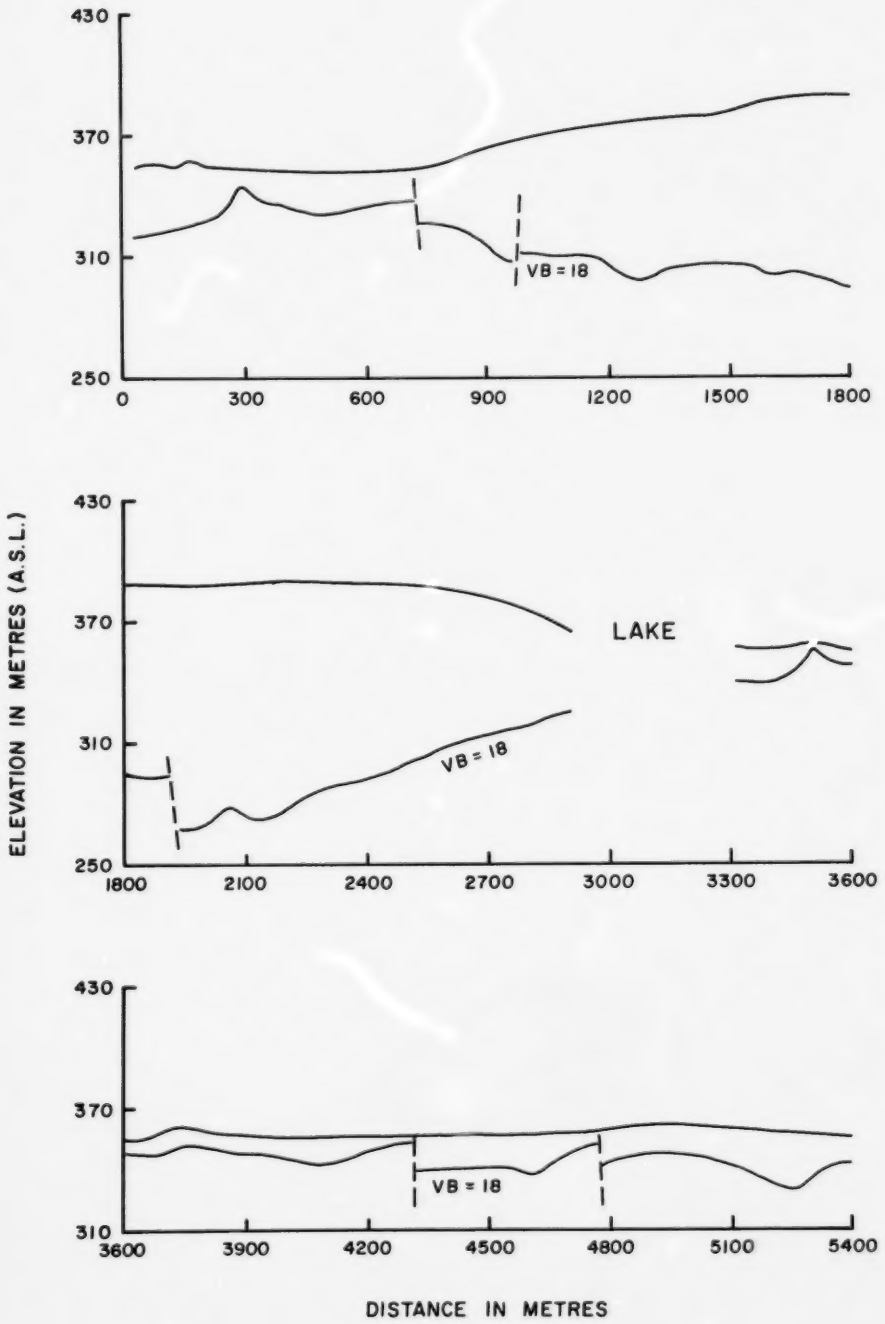
PROFILE S - S'

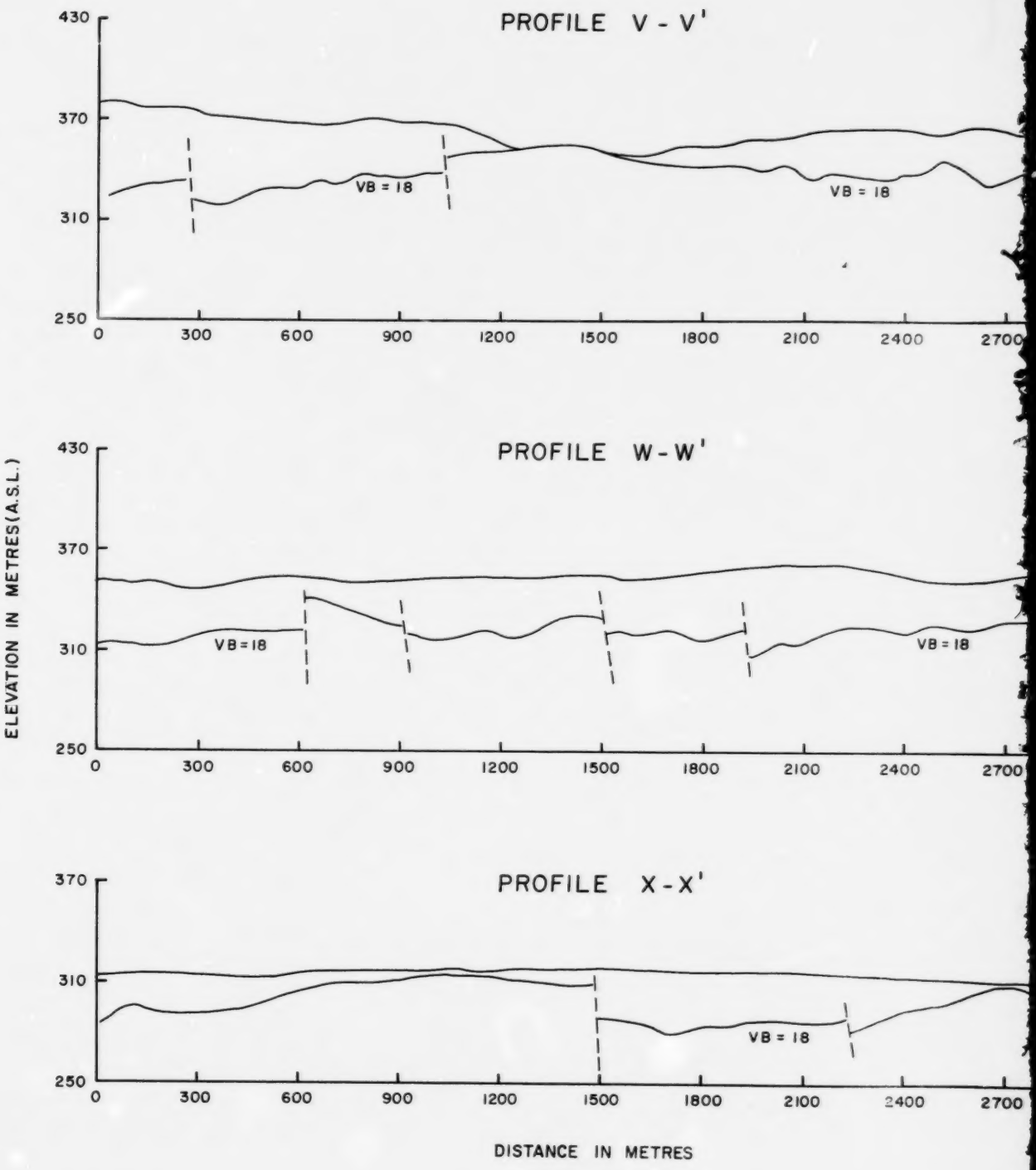

430
370
310
250
VB = 18
0
300
600
900
1200
1500
ELEVATION IN METRES (A.S.L.)
1500
1800
2100
2400
2700
3000
3300
3600
3900
4200
4500
DISTANCE IN METRES

PROFILE T - T'

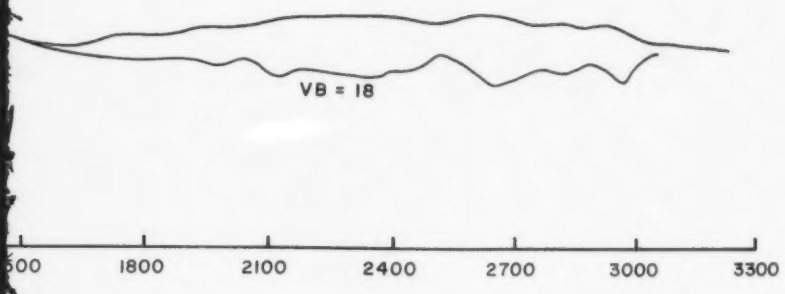

430
370
310
250
VB = 18
0
300
600
900
1200
1500
430
370
310
250
VB = 18
1500
1800
2100
2400
2700
3000
ELEVATION IN METRES (A.S.L.)
DISTANCE IN METRES

PROFILE U - U'

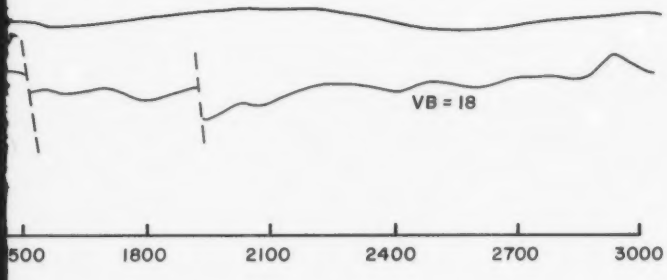

430
370
310
250
0
300
600
900
1200
1500
1800
VB = 18
LAKE
VB = 18
1800
2100
2400
2700
3000
3300
3600
VB = 18
3600
3900
4200
4500
4800
5100
5400
ELEVATION IN METRES (A.S.L.)
DISTANCE IN METRES


PROFILE V - V'
430
370
310
250
VB = 18
VB = 18
0
300
600
900
1200
1500
1800
2100
2400
2700
PROFILE W-W'
ELEVATION IN METRES(A.S.L.)
VB=18
VB = 18
PROFILE X-X'
VB = 18
DISTANCE IN METRES

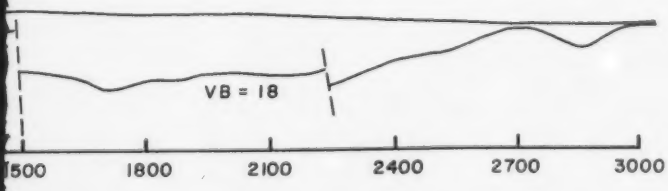
E V - V'



E W - W'

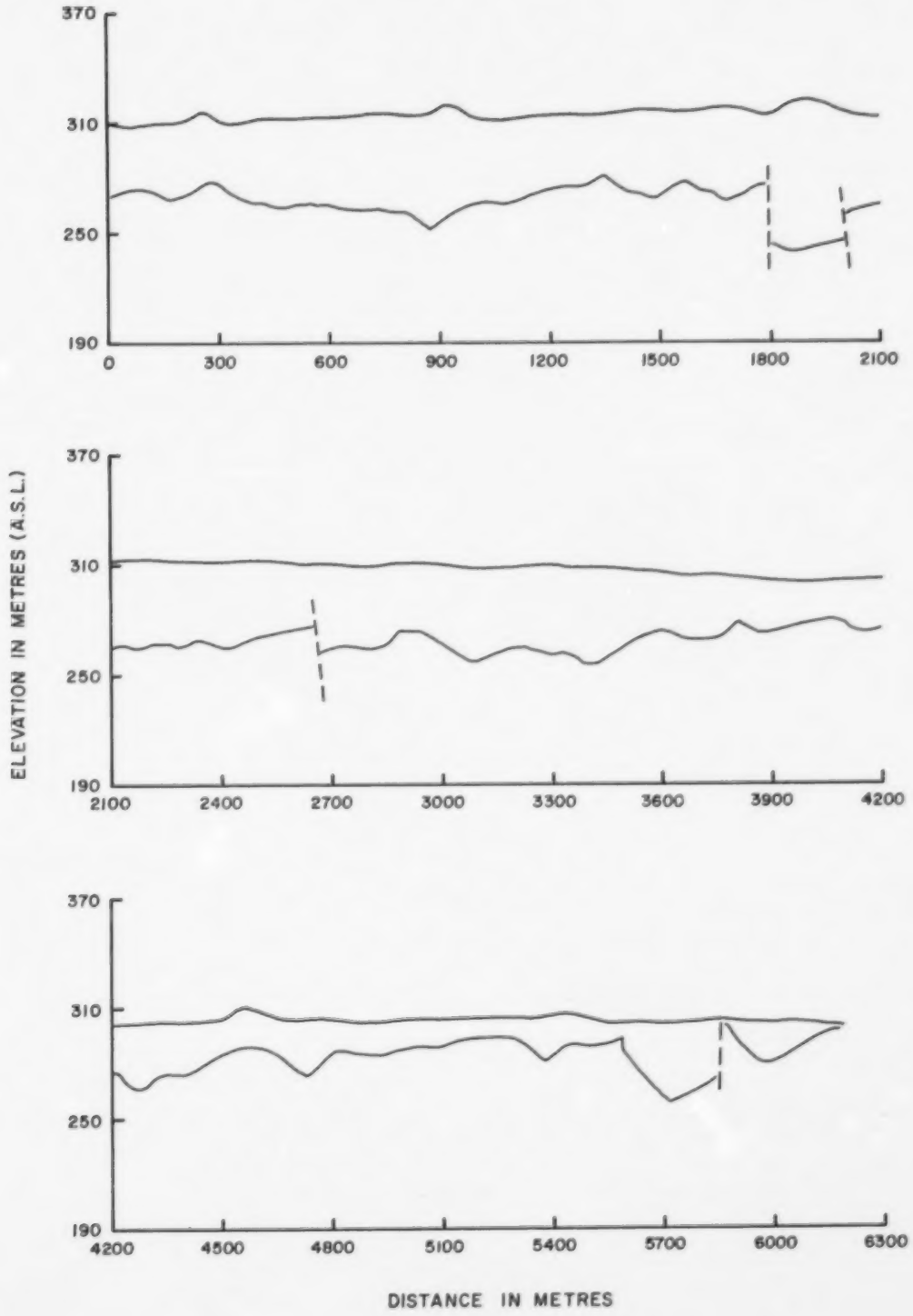


E X - X'

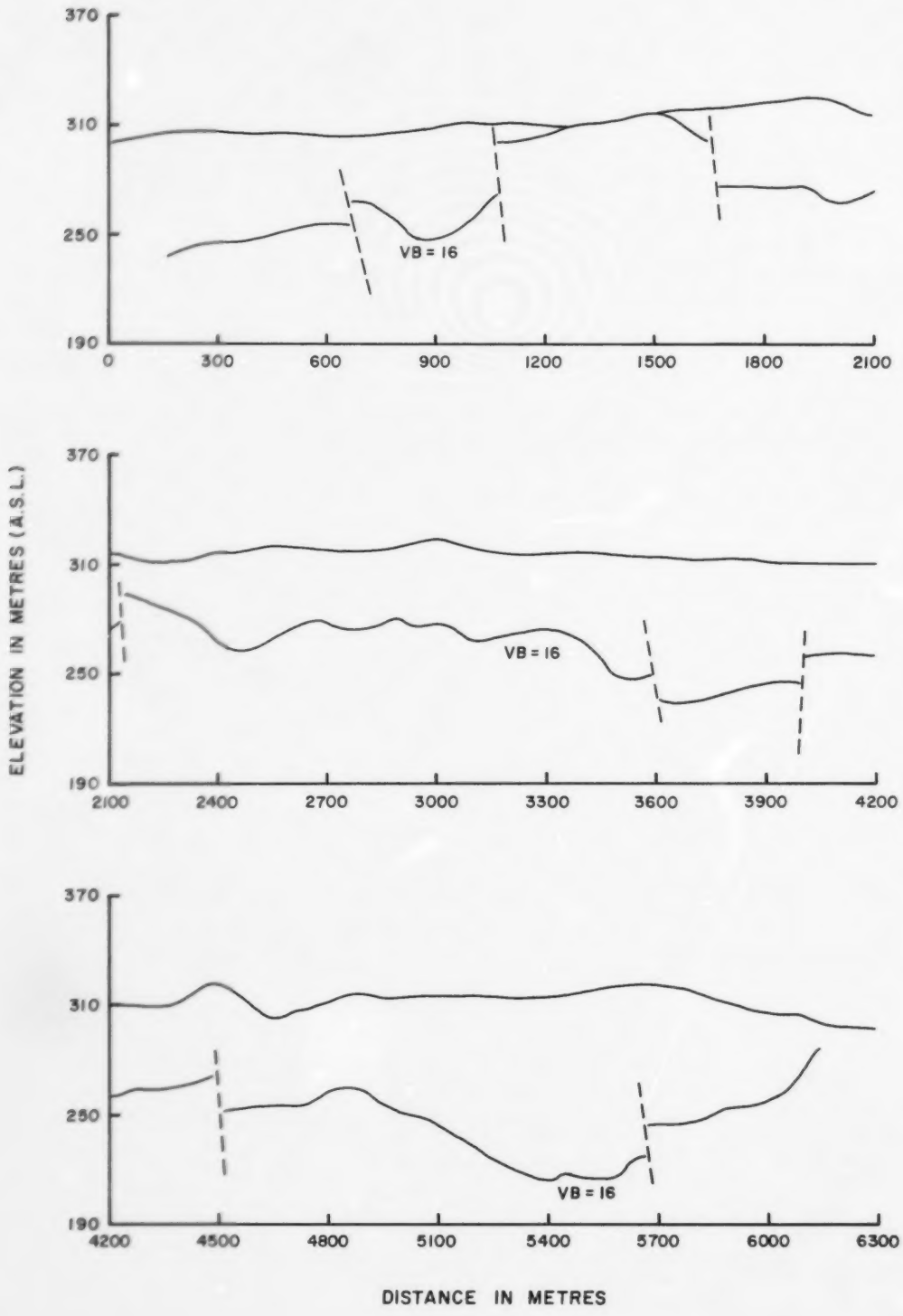


IN METRES

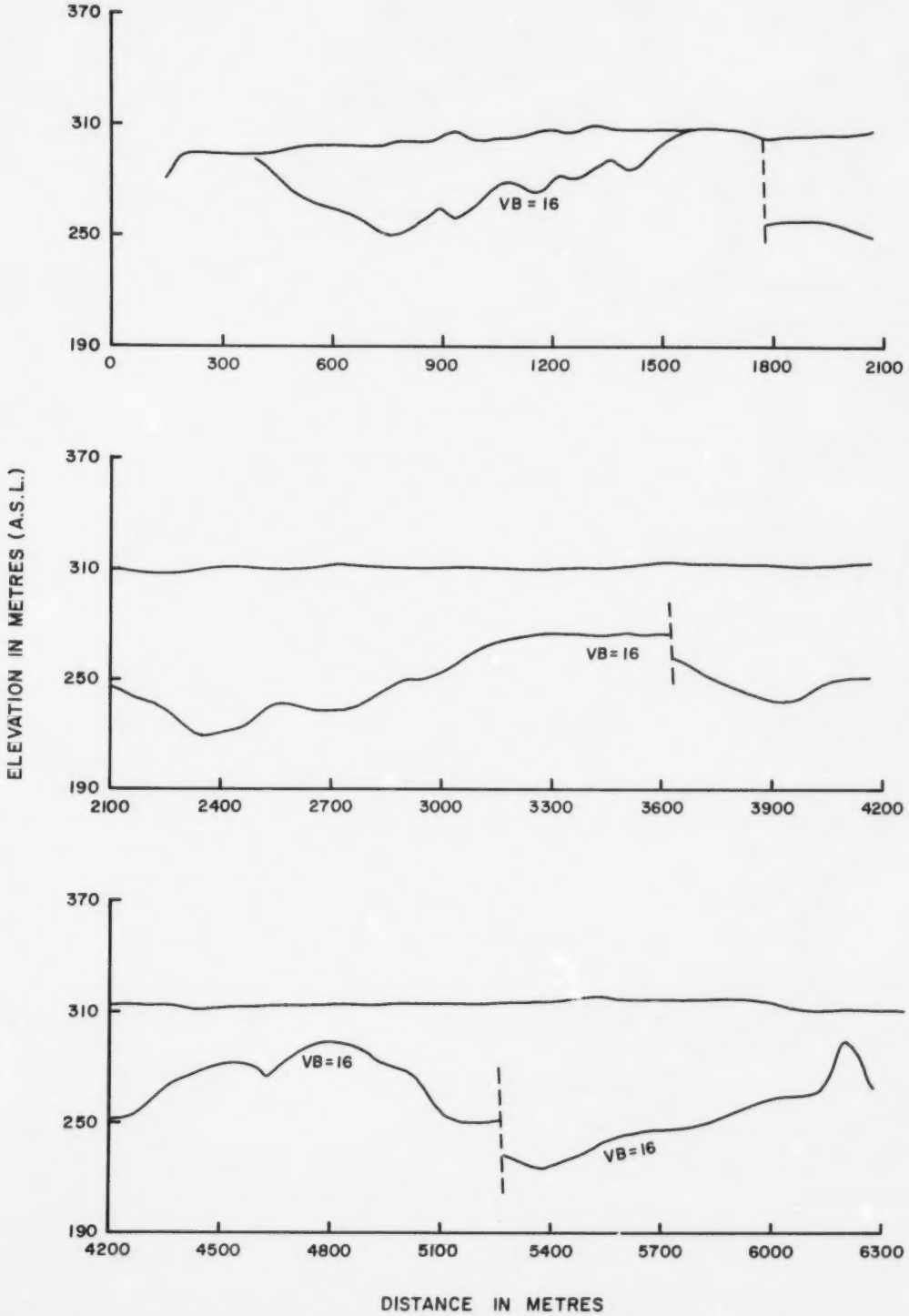
PROFILE Y - Y'


370
310
250
190
0
300
600
900
1200
1500
1800
2100
2400
2700
3000
3300
3600
3900
4200
4500
4800
5100
5400
5700
6000
6300
ELEVATION IN METRES (A.S.L.)
DISTANCE IN METRES

PROFILE Z - Z'


370
310
250
190
VB = 16
0
300
600
900
1200
1500
1800
2100
2400
2700
3000
3300
3600
3900
4200
4500
4800
5100
5400
5700
6000
6300
ELEVATION IN METRES (A.S.L.)
DISTANCE IN METRES

PROFILE ZI - ZI'



Printed by offset lithography by the Saskatchewan Government Printing Company, Regina, Sask.

Stock:
Cover: Mayfair 130 lb. (White)
Overprinted in Process Blue
Text: Offset 60 lb. (White)

Type: Helvetica
Point Size:
Body Matter: 9/11 light
First Heading: 14 point medium
Second Heading: 10 point medium
Third Heading: 9 point medium
Captions: 9 point light
Footnotes: 9 point light

104° 30′

104° 00′

58°30′

Durnant Lake

La Rocque Lake

Murphy Lake

Le Drew Lake

Smith Bay

Mallon

Edge of the Athabasca Formation

K

7

6

5

4

3

2

103° 30′
Hatchet Lake
Smith Bay
Topping
Island
dge of the Athabasca Formation
4
3
2
Tromburg
Bay
Scrimes
Lake
Evans Creek
Redwillow Rapids
58°30′
Fond-du-lac River
1
Lasby
Lake
K'
Cumming Bay

Unknown Lake

Murphy

Mallen Lake

North McMahon Lake

South McMahon Lake

JEB

14

11

11a

11b

Dawn Lake

Henday Lake

Hamilton Lake

Midwest Lake

Torwell Lake

Moffatt Lake

McClean Lake

North

South

58° 15'

Waterfound River

Kelly Bay

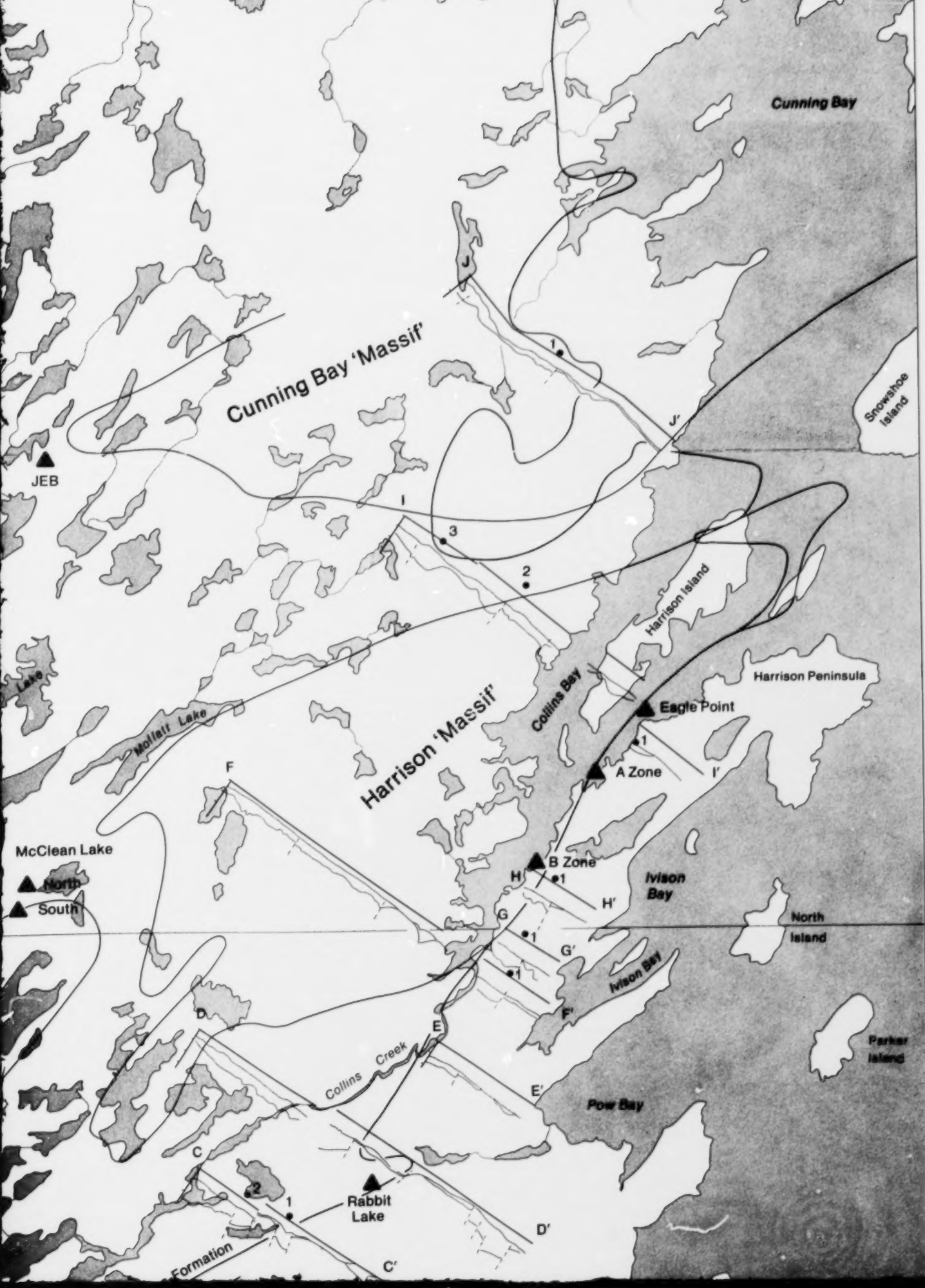
Nicholson Island

Waterbury Lake

McClean 'Massif'

Creek

Collins


Cunning Bay
Cunning Bay 'Massif'
Snowshoe Island
JEB
Harrison Island
Harrison Peninsula
Harrison 'Massif'
Collins Bay
Eagle Point
A Zone
B Zone
Ivison Bay
North Island
58°15'
McClean Lake
North
South
Mollatt Lake
Collins Creek
Parker Island
Pow Bay
Rabbit Lake
Formation
A
A'
B
B'
C
C'
D
D'
E
E'
F
F'
G
G'
H
H'
I
I'
J
J'

Map 1

Location of Seismic Profiles Wollaston Lake Area

J. V. Suryam Report 216 B
Saskatchewan Energy and Mines

Legend

A A' — 370 / 310 — Geographically located seismic profiles drawn to show basement surface

1 2 — Recommended targets for further exploration

Archean 'Massif' with aeromagnetic axis (after Sibbald, 1980 and Ray, 1978)

▲ Uranium deposits, occurrences

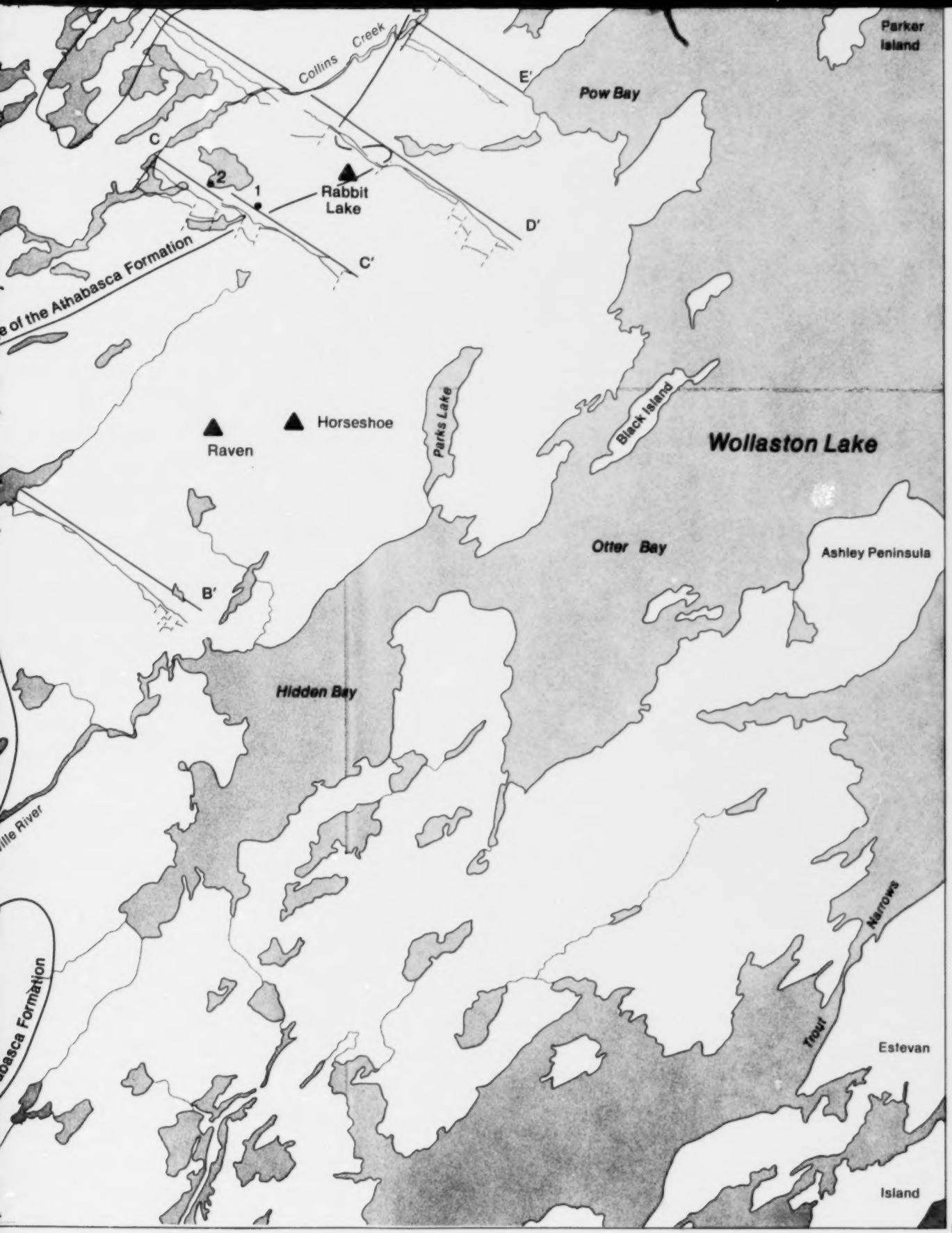
Scale 1:100,000

Kilometres 1 0 1 2 3 4 5 6 Kilometres

Miles 1 0 1 2 3 4 Miles

Kelly Bay
Nicholson Island
Waterbury Lake
Thompson Lakes
Thorburn Lake
Milliken Creek
Umpherville River
McClean 'Massif'
Collins
Kewen Lake
Lampin Lake
East Lampin Lake
Edge of the Athabasca Formation
Umpherville River
Manatow Lake
Kidd Lake
A
A'
B
1

58°00'
104° 30'
104° 00'


Collins Creek
E'
Pow Bay
Parker Island
C
2
1
Rabbit Lake
D'
C'
e of the Athabasca Formation
Raven
Horseshoe
Parks Lake
Black Island
Wollaston Lake
Otter Bay
Ashley Peninsula
B'
Hidden Bay
ille River
basca Formation
Narrows
Trout
Estevan
Island
158° 00'
103° 30'

105°00′

104°30′

Black Lake

Burr Falls

Burr Island

Z1

Z

Edge of the Athabasca Formation

Y′

Jervois Creek

Y

1

Eisenhauer Lake

Z1′

Z′

Perch River

X′

X

1

Perching Lake

Newnham

Fond du - lac River

Brink Lake

Fond - du - lac River

Brink Rapids

Brassy Rapids

North Rapids

Hawrock Rapids

59°00′

104°30'

104°00'

Cyprian Lake

Gauthier Lake

Jervois Creek

Penner Lake

Gauthier Creek

Heden Lake

X

1

Lake

W

1

W'

V'

V

1

Moosomin Lake

U'

Swift Current Lake

1

U

Otter Lake

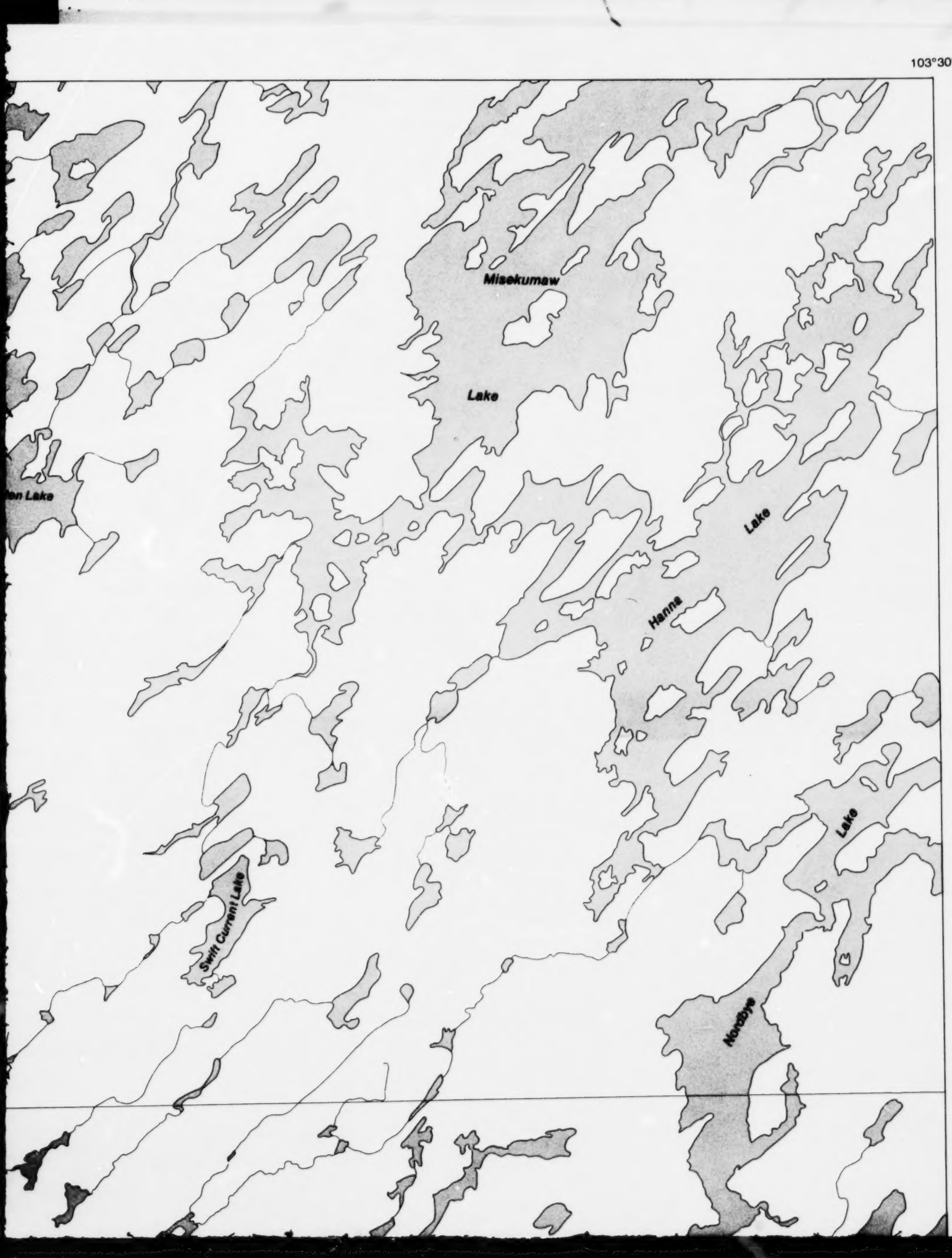
T'

T

Red Bank

Manitou Falls

Thompson Rapids


103°30'
Misekumaw
Lake
Lake
Hanna
Lake
Swift Current Lake
Nordbye
Lake
59°

Brink Lake

Fond - du - lac River

Brink Rapids

Brassy Rapids

North Rapids

Hawrock Rapids

59°00'

Umfreville Lake

Orr Lake

Hawkrock River

McDonald Creek

Pattyson Lake

Moosonee Lake
Otter Lake
Manitou Falls
Thompson Rapids
Small Lake
Red Bank Falls
Kosdaw Lake
Swift Current Lake
Fond-du-lac River
Edge of the Athabasca Formation
V
V'
U
U'
T
T'
S
S'
R
R'
Q
Q'
1

Swift Current Lake
Nordbye
59° 00'
Lake
Bebiche
R'
Edge of the Athabasca Formation
Obsi Lake
Merritt
Lake
Q'

Map 2

Location of Seismic Profiles
Black Lake Area

J. V. Suryam Report 216 B
Saskatchewan Energy and Mines

Legend

Geographically located seismic profiles drawn to show basement surface

1 2 Recommended targets for further exploration

Archean 'Massif' with aeromagnetic axis (after Sibbald, 1980 and Ray, 1978)

Scale 1:100,000

Kilometres 1 0 1 2 3 4 5 6 Kilometres

Miles 1 0 1 2 3 4 Miles

Whigham Lake

Waterfound Bay

Fond-du-lac River

Edge of the Athabasca Formation

Fond-du-lac River

Waterfound River

Kernaghan Lake

Crocked Lake

Crooked Lake

Crooked Lake

Richardson Lake

Corson Lake

Hatch

Q

Q'

P

P'

O

O'

N

N'

M

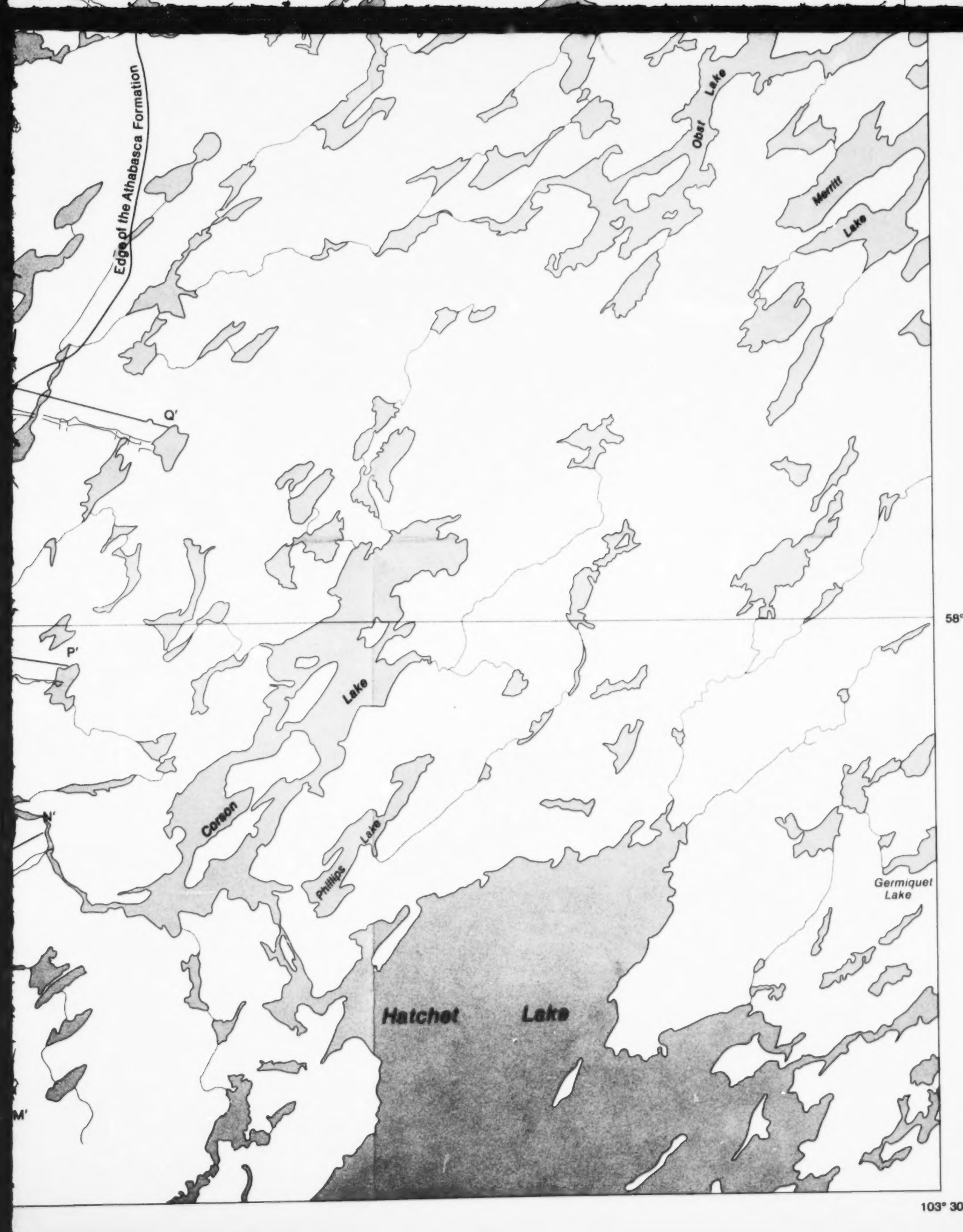
M'

L

L'

104° 30'

104° 00'


Edge of the Athabasca Formation
Obst Lake
Merritt Lake
Q'
58°
P'
Lake
N'
Corson
Phillips Lake
Germiquet Lake
Hatchet Lake
M'
103° 30